

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT				1. CONTRACT ID CODE		PAGE OF PAGES 1 4			
2. AMENDMENT/MODIFICATION NO. 0002			3. EFFECTIVE DATE 20 JUN 2002		4. REQUISITION/PURCHASE REQ. NO.		5. PROJECT NO. <i>(If applicable)</i> DACW66-02-B-0008		
6. ISSUED BY Department of the Army Memphis District, Corps of Engineers 167 North Main Street, Rm B202 ATTN: CEMVM-CT Memphis, TN 38103-1894			CODE W38XGR		7. ADMINISTERED BY <i>(If other than Item 6)</i>			CODE	
8. NAME AND ADDRESS OF CONTRACTOR <i>(No., street, county, State and ZIP Code)</i>						(✓)		9A. AMENDMENT OF SOLICITATION NO. DACW66-02-B-0008	
						✗		9B. DATED <i>(SEE ITEM 11)</i> 28 FEB 2002	
								10A. MODIFICATION OF CONTRACTS/ORDER NO.	
								10B. DATED <i>(SEE ITEM 13)</i>	
CODE			FACILITY CODE						

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☒ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers tended. ☒ is extended, ☐ is not ex-

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

**13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS,
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.**

(✓)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: <i>(Specify authority)</i> THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES <i>(such as changes in paying office, appropriation date, etc.)</i> SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER <i>(Specify type of modification and authority)</i>

E. IMPORTANT: Contractor ☐ is not, ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

**This solicitation for New Madrid Riverfront Improvements, New Madrid, MO, is scheduled to open
16 JUL 2002 at 2:30 P.M., local time at place of bid opening.**

1. SECTION 00010, PAGE 00010-1, STANDARD FORM 1442, BLOCK 10, PARAGRAPH 2.

Paragraph 2 is deleted and replaced with the following: "The work consists of furnishing all plant, labor, materials and equipment for a new boat ramp with expanded parking, a lighted levee walkway approximately 860 feet in length located on the riverside crown of the main line levee, levee terraces on levee slope at boat ramp, fill material and sod on the levee riprap above the normal highwater mark to facilitate maintenance of the levee by local interests, clearing and disposal of debris and environmental protection."

(AMENDMENT #0002 - CONTINUED ON NEXT PAGE)

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER <i>(Type or print)</i>		16A. NAME AND TITLE OF CONTRACTING OFFICER <i>(Type or print)</i>	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
_____ <i>(Signature of person authorized to sign)</i>		BY _____ <i>(Signature of Contracting Officer)</i>	

2. SECTION 00010, PAGE 00010-1, STANDARD FORM 1442, BLOCK 11. The time for completion is changed from 450 calendar days to 340 calendar days after receiving notice to proceed. See Section 00800, Paragraph No. 1.1, "Commencement, prosecution and Completion of Work".
3. SECTION 00010, PAGE 00010-1, STANDARD FORM 1442, BLOCK 13A.
**THE HOUR AND DATE FOR OPENING OF BIDS ARE RESCHEDULED AS
16 JUL 2002, AT 2:30 P.M., LOCAL TIME AT PLACE OF BID.**
4. SECTION 00010, PAGES 00010-3 THRU 00010-4, BIDDING SCHEDULE.
Pages 00010-3 and 00010-4 are deleted in their entirety and replaced with the attached Bidding Schedule, Pages 00010-3b and 00010-4b.
5. SECTION 00010, WAGE RATES. General Decision Number MO010001, revision 13, dated 12/28/2001, is deleted in its entirety and replaced with the attached General Decision Number MO020001, revision 5, dated 6/7/2002.
6. SECTION 00010, WAGE RATES. General Decision Number MO010018, revision 2, dated 9/7/2001, is deleted in its entirety and replaced with the attached General Decision Number MO020018, revision 2, dated 6/7/2002.
7. SECTION 00100, PAGE 00100-4, CLAUSE 52.0-4078, "SITE VISIT",
PARAGRAPH (b). Section 00100, 52.0-4078(b) is deleted in its entirety and replaced with the following: "(b) Two organized site visits have been scheduled for 27 JUN 2002 and 9 JUL 2002."
8. TECHNICAL TABLE OF CONTENTS. The Technical Table of Contents is deleted in its entirety and replaced with the attached Technical Table of Contents, Page TOCb-1.
9. THE FOLLOWING SECTIONS ARE DELETED IN THEIR ENTIRETY:

DELETE SECTION #

02701 REINFORCED CONCRETE CULVERT PIUPE
02875 PREFABRICATED RESTROOM
02876 PREFABRICATED GAZEBO
03360 IMPRINTED CONCRETE PAVING
04220 NONBEARING MASONRY VENEER
07416 STRUCTURAL STANDING SEAM METAL ROOF SYSTEM
07600 SHEET METAL WORK, GENERAL
09915 COLOR SCHEDULE
15400 PLUMBING, GENERAL PURPOSE

(AMENDMENT #0002 - CONTINUED ON NEXT PAGE)

10. THE FOLLOWING SECTIONS ARE DELETED IN THEIR ENTIRETY AND REPLACED WITH THE ATTACHED CORRESPONDING SECTION:

<u>DELETE SECTION #</u>	<u>REPLACE W/ATTACHED SECTION #</u>
00800	00800b
DIVISION 1 - GENERAL REQUIREMENTS	
01090	01090b
01130	01130b
01270	01270b
01330	01330b
01356	01356b
01450	01450b
01451	01451b
DIVISION 2 – SITEWORK	
02216	02216b
02230	02230b
02231	02231b
02234	02234b
02300	02300b
02370	02370b
02378	02378b
02710	02710b
02722	02722b
02754	02754b
02763	02763b
02782	02782b
02832	02832b
02871	02871b
02922	02922b
02930	02930b
DIVISION 3 – CONCRETE	
03100	03100b
03150	03150b
03200	03200b
03300	03300b
DIVISION 5 – METALS	
05055	05055b
05720	05720b
DIVISION 9 – FINISHES	
09900	09900b
DIVISION 16 – ELECTRICAL	
16070	16070b
16415	16415b

(AMENDMENT #0002 - CONTINUED ON NEXT PAGE)

11. CONTRACT DRAWINGS. All original contract drawings are deleted in their entirety. The following contract drawings, listed by file number, are hereby incorporated in this solicitation. (See Section 00800, Paragraph No. 1.5e, Contract Drawings and Specifications, Index To Drawings.)

AMENDED DRAWINGS INCORPORATED IN THIS SOLICITATION:

001b0169	018b0169	035b0169	052b0169
002b0169	019b0169	036b0169	053b0169
003b0169	020b0169	037b0169	054b0169
004b0169	021b0169	038b0169	055b0169
005b0169	022b0169	039b0169	056b0169
006b0169	023b0169	040b0169	057b0169
007b0169	024b0169	041b0169	058b0169
008b0169	025b0169	042b0169	059b0169
009b0169	026b0169	043b0169	060b0169
010b0169	027b0169	044b0169	061b0169
011b0169	028b0169	045b0169	062b0169
012b0169	029b0169	046b0169	063b0169
013b0169	030b0169	047b0169	064b0169
014b0169	031b0169	048b0169	065b0169
015b0169	032b0169	049b0169	066b0169
016b0169	033b0169	050b0169	067b0169
017b0169	034b0169	051b0169	068b0169

END OF AMENDMENT #0002

**THE NEW MADRID RIVERFRONT IMPROVEMENTS
NEW MADRID, MISSOURI**

**SECTION 00010b
BIDDING SCHEDULE**

<u>Item</u>	<u>Description</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
0001	Mobilization/Demobilization	1	LS	—	
0002	Environmental Protection	1	LS	—	
0003	Riprap "R90"	1900	TN		
0004	Riprap "R200"	13,698	TN		
0005	Clearing and Grubbing	1	LS	—	
0006	Demolition	1	LS	—	
0007	Debris Clean-up	1	LS	—	
0008	Excavation	564	CY		
0009	Impervious Backfill	5413	CY		
0010	Topsoil	8284	CY		
0011	Erosion Control Blanket	21,738	SY		
0012	Geotextile	22,042	SY		
0013	Asphaltic Concrete Pavement	461	TN		
0014	Aggregate Base Course	3400	CY		
0015	Concrete Paving	5518	SY		
0016	Pavement Markings	1	LS	—	
0017	Walkway with Brick Pavers	317	SY		
0018	Segmental Concrete Block Retaining Wall	1833	SF		
0019	Site Furnishings	1	LS	—	
0020	Sodding	24,881	SY		
0021	Exterior Planting	1	LS	—	
0022	Cast-In-Place Structural Concrete	449	CY		
0023	Curb and Gutter	2421	LF		
0024	River Access	1	LS	—	
0025	Stone Veneer (Existing Retaining Wall)	1030	SF		
0026	Sign (New Madrid)	1	LS	—	
0027	Signs (Traffic)	1	LS	—	
0028	Handrail / Levee Walkway	550	LF		
0029	Handrail / Stairs	286	LF		
0030	Street Lights	1	LS	—	
0031	Electrical Work	1	LS	—	
0032	Handrail/Boat Ramp	263	LF		
TOTAL ITEMS 0001 THRU 0032					

LS = Lump Sum
LF = Linear Feet

CY = Cubic Yard
TN = Ton

SY = Square Yard

SF = Square Feet

Notes:

1. Bidders shall furnish unit prices for all items listed on the schedule of bid items that require unit prices. If the bidder fails to insert a unit price in the appropriate blank for required items, but does furnish an extended total or an estimated amount for such item, the Government will deem his unit price to be the quotient obtained by dividing the extended estimated amount for that line item by the quantity. IF THE BIDDER OMITTS BOTH THE UNIT PRICE AND THE EXTENDED AMOUNT FOR ANY ITEM, HIS BID WILL BE DECLARED NONRESPONSIVE.
2. Award will be made as a whole to one bidder.
3. All quantities are estimated except where unit is given as "LS".
4. If a bid or modification to a bid based on unit prices is submitted and provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price, including lump sum units, in bid schedule must be stated, or if it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a pro rata basis to every price in the bid schedule.
5. Bidders are cautioned to read Contract Clause entitled "Required Central Contractor Registration" (252.204-7004) located in Section 00700.

TECHNICAL POC: Jerry Welch (901) 544-3236
Jerry.R.Welch@usace.army.mil

ADMINISTRATIVE POC: WENDELL NORMAN 901-544-0775
Wendell.N.Norman@usace.army.mil

General Decision Number MO020001

General Decision Number MO020001
 Superseded General Decision No. MO010001 State: Missouri
 Construction Type:

HEAVY

HIGHWAY

County(ies):

STATEWIDE

HEAVY AND HIGHWAY CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	03/01/2002
1	04/12/2002
2	05/03/2002
3	05/10/2002
4	05/24/2002
5	06/07/2002

COUNTY(ies):

STATEWIDE

CARP0007M 04/01/2001

	Rates	Fringes
CASS (Richards-Gebauer AFB ONLY), CLAY, JACKSON, PLATTE AND RAY COUNTIES		
CARPENTERS & PILEDRIVERS	25.50	6.88

 CARP0008C 05/01/1999

	Rates	Fringes
ST. LOUIS COUNTY AND CITY		
CARPENTERS	26.49	5.69

 CARP0011A 05/01/2001

	Rates	Fringes
CARPENTERS & PILEDRIVERS:		
JEFFERSON AND ST. CHARLES COUNTIES	26.29	5.40
FRANKLIN COUNTY	23.78	5.40
WARREN COUNTY	23.78	5.40
LINCOLN COUNTY	23.39	5.40
PIKE, ST. FRANCOIS AND WASHINGTON COUNTIES	22.44	5.40
BUCHANAN, CLINTON, JOHNSON AND LAFAYETTE COUNTIES	22.68	5.99
ATCHISON, ANDREW, BATES, CALDWELL, CARROLL, DAVIESS, DEKALB, GENTRY, GRUNDY, HARRISON, HENRY, HOLT,		

LIVINGSTON, MERCER, NODAWAY, ST. CLAIR, SALINE AND WORTH COUNTIES	22.03	5.99
BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, JASPER, LACLEDE, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, STONE, TANEY, VERNON, WEBSTER AND WRIGHT COUNTIES	21.68	5.99
CRAWFORD, DENT, GASCONADE, IRON, MADISON, MARIES, MONTGOMERY, PHELPS, PULASKI, REYNOLDS, SHANNON, AND TEXAS COUNTIES	21.73	5.40
RALLS, MARION, LEWIS, CLARK AND SCOTLAND COUNTIES	21.88	5.40
BENTON, MORGAN AND PETTIS COUNTIES	21.83	6.24
ADAIR, AUDRAIN, BOONE, CALLAWAY, CHARITON, COLE, COOPER, HOWARD, KNOX, LINN, MACON, MILLER, MONITEAU, MONROE, OSAGE, PUTNAM, RANDOLPH, SCHUYLER, SHELBY AND SULLIVAN	23.13	6.24
BOLLINGER, BUTLER, CAPE GIRARDEAU, DUNKLIN, MISSISSIPPI, NEW MADRID, PEMISCOT, PERRY, STE. GENEVIEVE, SCOTT, STODDARD AND WAYNE COUNTIES	22.46	4.72
CARTER, HOWELL, OREGON AND RIPLEY COUNTIES	21.54	4.72

* ELEC0001B 06/01/2002

	Rates	Fringes
BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, FRANKLIN, IRON, JEFFERSON, LINCOLN, MADISON, MISSISSIPPI, NEW MADRID, PEMISCOT, PERRY, REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS, ST. LOUIS (City and County), STE. GENEVIEVE, SCOTT, STODDARD, WARREN, WASHINGTON AND WAYNE COUNTIES ELECTRICIANS	29.20	15.64

ELEC0002D 09/02/2001

	Rates	Fringes
ADAIR, AUDRAIN, BOONE, CALLAWAY, CAMDEN, CARTER, CHARITON, CLARK, COLE, COOPER, CRAWFORD, DENT, FRANKLIN, GASCONADE, HOWARD, HOWELL, IRON, JEFFERSON, KNOX, LEWIS, LINCON, LINN, MACON, MARIES, MARION, MILLER, MONITEAU, MONROE, MONTGOMERY, MORGAN, OREGON, OSAGE, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS, ST. LOUIS (City and County), STE. GENEVIEVE, SCHUYLER, SCOTLAND,		

SHANNON, SHELBY, SULLIVAN, TEXAS, WARREN AND WASHINGTON
COUNTIES.

LINE CONSTRUCTION:

Lineman & Cable Splicer	27.48	42% + 2.10
Groundman Equipment Operator	24.60	42% + 2.10
Groundman Winch Driver	20.22	42% + 2.10
Groundman, Groundman Driver	19.47	42% + 2.10

ELEC0053F 08/27/2000

	Rates	Fringes
BATES, BENTON, CARROLL, CASS, CLAY, HENRY, JACKSON, JOHNSON, LAFAYETTE, PETTIS, PLATTE, RAY, AND SALINE COUNTIES.		

LINE CONSTRUCTION:

Lineman	27.80	9.99
Lineman Operator	25.97	9.46
Groundman Powderman	19.45	7.59
Groundman	18.49	7.31

ANDREW, ATCHINSON, BARRY, BARTON, BUCHANAN, CALDWELL, CEDAR,
CHRISTIAN, CLINTON, DADE, DALLAS, DAVIESS, DE KALB, DOUGLAS,
GENTRY, GREENE, GRUNDY, HARRISON, HICKORY, HOLT, JASPER, LACLEDE,
LAWRENCE, LIVINGSTON, McDONALD, MERCER, NEWTON, NODAWAY, OZARK,
POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER, WORTH, AND
WRIGHT COUNTIES.

LINE CONSTRUCTION:

Lineman	26.75	9.69
Lineman Operator	25.41	9.30
Groundman Powderman	18.69	7.37
Groundman	17.30	6.98

ELEC0095C 06/01/2001

	Rates	Fringes
BARRY, BARTON, CEDAR, CRAWFORD, DADE, JASPER, LAWRENCE, MCDONALD, NEWTON, ST CLAIR, AND VERNON COUNTIES		

ELECTRICIANS:

Electricians	20.51	5.68
Cable Splicers	20.86	5.68

ELEC0124I 08/27/2001

	Rates	Fringes
BATES, BENTON, CARROLL, CASS, CLAY, COOPER, HENRY, JACKSON, JOHNSON, LAFAYETTE, MORGAN, PETTIS, PLATTE, RAY AND SALINE COUNTIES:		

ELECTRICIANS	28.78	11.87
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ELEC0257C 03/01/1999

	Rates	Fringes
AUDRAIN (Except, Cuivre Township), BOONE, CALLAWAY, CAMDEN,		

CHARITON, COLE, CRAWFORD, DENT, GASCONADE, HOWARD, MARIES,
MILLER, MONITEAU, OSAGE, PHELPS AND RANDOLPH COUNTIES:

Electricians	20.95	8.88
Cable Splicers	21.95	8.88

ELEC0350B 12/01/2000

	Rates	Fringes
ADAIR, AUDRAIN (East of Highway 19), CLARK, KNOX, LEWIS, LINN, MACON, MARION, MONROE, MONTGOMERY, PIKE, PUTNAM, RALLS, SCHUYLER, SCOTLAND, SHELBY AND SULLIVAN COUNTIES		

ELECTRICIANS	24.06	7.44
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ELEC0453D 09/01/2001

	Rates	Fringes
CHRISTIAN, DALLAS, DOUGLAS, GREENE, HICKORY, HOWELL, LACLEDE, OREGON, OZARK, POLK, SHANNON, WEBSTER AND WRIGHT COUNTIES		

ELECTRICIANS	20.85	5.37+10%
PULASKI AND TEXAS COUNTIES		
ELECTRICIANS	25.50	5.37+10%
STONE AND TANEY COUNTIES		
ELECTRICIANS	14.45	4.97+10%

ELEC0545D 12/01/2001

	Rates	Fringes
ANDREW, BUCHANAN, CLINTON, DEKALB, ATCHISON, HOLT, MERCER, GENTRY, HARRISON, DAVIESS, GRUNDY, WORTH, LIVINGSTON, NODAWAY, AND CALDWELL COUNTIES		

ELECTRICIANS	25.78	8.56
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ELEC0702D 09/04/1995

	Rates	Fringes
BOLLINGER, BUTLER, CAPE GIRARDEAU, DUNKLIN, MADISON, MISSISSIPPI, NEW MADRID, PEMISCOT, SCOTT, STODDARD AND WAYNE COUNTIES		

LINE CONSTRUCTION:

Lineman	25.50	17%+2.00
Groundman Equipment Operator (all crawler type equipment D-4 and larger)	21.87	17%+2.00
Groundman - Class A	15.45	17%+2.00

ENGI0016A 05/01/2001

	Rates	Fringes
BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, JASPER, LAWRENCE, HICKORY, LACLEDE, MCDONALD, NEWTON, OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER AND WRIGHT COUNTIES		

POWER EQUIPMENT OPERATORS

GROUP 1	20.12	5.95
GROUP 2	19.77	5.95
GROUP 3	19.57	5.95
GROUP 4	17.52	5.95

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt finishing machine & trench widening spreader; asphalt plant console operator; autograder; automatic slipform paver; backhoe; blade operator - all types; boat operator - tow; boilers-2; central mix concrete plant operator; clamshell operator; concrete mixer paver; crane operator; derrick or derrick trucks; ditching machine; dozer operator; dragline operator; dredge booster pump; dredge engineman; dredge operator; drill cat with compressor mounted on cat; drilling or boring machine rotary self-propelled; highloader; hoisting engine - 2 active drums; launch hammer wheel; locomotive operator; - standard guage; mechanic and welders; mucking machine; off-road trucks; piledriver operator; pitman crane operator; push cat operator; quad trac; scoop operator - all types; shovel operator; sideboom cats; skimmer scoop operators; trenching machine operator; truck crane.

GROUP 2: A-frame; asphalt hot-mix silo; asphalt plant fireman (drum or boiler); asphalt plant man; asphalt plant man; asphalt plant mixer operator; asphalt roller operator; backfiller operator; barber-greene loader; boat operator (bridges and dams); chip spreader; concrete mixer operator - skip loader; concrete plant operator; concrete pump operator; crusher operator; dredge oiler; elevating grader operator; fork lift; greaser-fleet; hoisting engine - 1; locomotive operator - narrow gauge; multiple compactor; pavement breaker; powerbroom - self-propelled; power shield; rooter; side discharge concrete spreader; slip form finishing machine; stumpcutter machine; throttle man; tractor operator (over 50 h.p.); winch truck.

GROUP 3: Boilers - 1; chip spreader (front man); churn drill operator; clef plane operator; concrete saw operator (self-propelled); curb finishing machine; distributor operator; finishing machine operator; flex plane operator; float operator; form grader operator; pugmill operator; roller operator, other than high type asphalt; screening & washing plant operator; siphons & jets; sub-grading machine operator; spreader box operator, self-propelled (not asphalt); tank car heater operator (combination boiler & booster); tractor operator (50 h.p. or less); Ulmac, Ulric or similar spreader; vibrating machine operator, not hand;

GROUP 4: Grade checker; Oiler; Oiler-Driver

HOURLY PREMIUMS:

The following classifications shall receive \$.25 above GROUP 1 rate: Clamshells - 3 yds. or over; Cranes - Rigs or Piledrivers,

100 ft. of boom or over (including jib); Draglines - 3 yds. or over; Hoists - each additional active drum over 2 drums; Shovels - 3 yds. or over;

The following classifications shall receive \$.50 above GROUP 1 rate: Tandem scoop operator; Cranes - Rigs or Piledrivers, 150 ft. to 200 ft. of boom (including jib); Tandem scoop.

The following classifications shall receive \$.75 above GROUP 1 rate: Cranes - Rigs or Piledrivers, 200 ft. of boom or over (including jib.).

ENGI0101A 05/01/2001

	Rates	Fringes
BUCHANAN, CASS, CLINTON AND LAFAYETTE COUNTIES		
POWER EQUIPMENT OPERATORS		
GROUP 1	21.70	8.15
GROUP 2	21.30	8.15
GROUP 3	19.30	8.15

ANDREW, ATCHISON, BATES, BENTON, CALDWELL, CARROLL, CHARITON, COOPER, DAVIESS, DEKALB, GENTRY, GRUNDY, HARRISON, HENRY, HOLT, HOWARD, JOHNSON, LINN, LIVINGSTON, MERCER, NODAWAY, PETTIS, SALINE, SULLIVAN AND WORTH COUNTIES

POWER EQUIPMENT OPERATORS		
GROUP 1	21.70	8.15
GROUP 2	21.30	8.15
GROUP 3	19.30	8.15

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt roller operator, finish; asphalt paver and spreader; asphalt plant operator; auto grader or trimmer or sub-grader; backhoe; blade operator (all types); boilers - 2; booster pump on dredge; bulldozer operator; boring machine (truck or crane mounted); clamshell operator; concrete mixer paver; concrete plant operator; concrete pump operator; crane operator; derrick or derrick trucks; ditching machine; dragline operator; dredge engineman; dredge operator; drill cat with compressor mounted (self-contained) or similar type self-propelled rotary drill (not air tract); drilling or boring machine (rotary-self-propelled); finishing machine operator; greaser; high loader-fork lift-skid loader (all types); hoisting engineer (2 active drums); locomotive operator (standard guage); mechanics and welders (field and plants); mucking machine operator; pile drive operator; pitman crane or boom truck (all types); push cat; quad track; scraper operators (all types); shovel operator; sideboom cats; side discharge spreader; skimmer scoop operators; slip form paver operator (CMI, Rex, Gomeco or equal); la tourneau roter (all tiller types); tow boat operator; truck crane; wood and log chippers (all types).

GROUP 2: A-frame truck operator; articulated dump truck; back

filler operator; boilers (1); chip spreader; churn drill operator; compressor; concrete mixer operator, skip loader; concrete saws (self-propelled); conveyor operator; crusher operator; distributor operator; elevating grader operator; farm tractor (all attachments); fireman rig; float operator; form grade operator; hoisting engine (one drum); maintenance operator; multiple compactor; pavement breaker, self-propelled hydra-hammer (or similar type); paymill operator; power shield; pumps; roller operator (with or without blades); screening and washing plant; self-propelled street broom or sweeper; siphons and jets; straw blower; stump cutting machine; siphons and jets; tank car heater operator (combination boiler and booster); welding machine; vibrating machine operator (not hand held); welding machine.
 GROUP 3: Oiler; oiler driver; mechanic.

HOURLY PREMIUMS:

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$.25) ABOVE GROUP 1 RATE: Dragline operator - 3 yds. & over; shovel 3 yds. & over; clamshell 3 yds. & over; Crane, rigs or piledrivers, 100' of boom or over (incl. jib.), hoist - each additional active drum over 2 drums

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$.50) ABOVE GROUP 1 RATE: Tandem scoop operator; crane, rigs or piledrivers 150' to 200' of boom (incl. jib.)

THE FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$.75) ABOVE GROUP 1 RATE: Crane rigs, or piledrivers 200 ft. of boom or over (including jib.)

 ENGI0101E 04/01/2002

	Rates	Fringes
CASS, CLAY, JACKSON, PLATTE AND RAY COUNTIES		
POWER EQUIPMENT OPERATORS:		
GROUP 1	23.79	8.97
GROUP 2	22.75	8.97
GROUP 3	18.28	8.97
GROUP 4	21.63	8.97
POWER EQUIPMENT OPERATORS CLASSIFICATIONS		
GROUP 1: Asphalt roller operator, finish; asphalt paver and spreader; asphalt plant operator; auto grader or trimmer or sub-grader; backhoe; blade operator (all types); boilers-2; booster pump on dredge; boring machine (truck or crane mounted); bulldozer operator; clamshell operator; concrete cleaning decontamination machine operator; concrete mixer paver; concrete plant operator; concrete pump operator; crane operator; derrick or derrick trucks; ditching machine; dragline operator; dredge engineman; dredge operator; drillcat with compressor mounted (self-contained) or similar type self propelled rotary drill (not air tract); drilling or boring machine (rotary -		

self-propelled); finishing machine operator; greaser; heavy equipment robotics operator/mechanic; horizontal directional drill operator; horizontal directional drill locator; loader-forklift - skid loader (all types); hoisting engineer (2 active drums); locomotive operator (standard guage); master environmental maintenance mechanic; mechanics and welders (field and plants); mucking machine operator; piledrive operator; pitman crane or boom truck (all types); push cat; quad-track; scraper operators (all types); shovel operator; side discharge spreader; sideboom cats; skimmer scoop operator; slip-form paver (CMI, REX, Gomaco or equal); la tourneau roter (all tiller types); tow boat operator; truck crane; ultra high perssure waterjet cutting tool system operator/mechanic; vacuum blasting machine operator/mechanic; wood and log chippers (all types)

GROUP 2: "A" Frame truck operator; articulated dump truck; back filler operator; boilers (1); chip spreader; churn drill operator; concrete mixer operator, skip loader; concrete saws (self-propelled); conveyor operator; crusher operator; distributor operator; elevating grader operator; farm tractor (all attachments); fireman rig; float operator; form grader operator; hoisting engine (1 drum); maintenance operator; multiple compactor; pavement breaker, self-propelled hydra-hammer (or similar type); power shield; paymill operator; pumps; siphons and jets; stump cutting machine; tank car heater operator (combination boiler and booster); compressor; roller operator (with or without blades); screening and washing plant; self-propelled street broom or sweeper; straw blower; tank car heater operator (combination boiler and booster); vibrating machine operator (not hand held)

GROUP 3: Oilers

GROUP 4: Oiler Driver (All Types)

FOOTNOTE:

HOURLY PREMIUMS

FOLLOWING CLASSIFICATIONS SHALL RECEIVE (\$.25) ABOVE GROUP 1 RATE: Clamshells - 3 yd. capacity or over; Cranes or rigs, 80 ft. of boom or over (including jib); Draglines, 3 yd. capacity or over; Piledrivers 80 ft. of boom or over (including jib); Shovels & backhoes, 3 yd. capacity or over.

ENGI0513D 05/06/2002

	Rates	Fringes
FRANKLIN, JEFFERSON, LINCOLN, ST CHARLES, AND WARREN COUNTIES		
POWER EQUIPMENT OPERATORS:		
GROUP 1	24.92	12.24
GROUP 2	23.62	12.24
GROUP 3	20.62	12.24

GROUP 4

23.17

12.24

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Backhoe, Cable; Backhoe, Hydraulic (2 cu yds bucket and under regardless of attachment, one oiler for 2 or 3, two oilers for 4 through 6); Backhoe, Hydraulic over 2 cu yds; Cableway; Crane, Crawler or Truck; Crane, Hydraulic - Truck or Cruiser mounted, 16 tons and over; Crane, Locomotive; crane with boom including jib over 100 ft from pin to pin; Crane using rock socket tool; Derrick, Steam; Derrick Car and Derrick Boat; Dragline, 7 cu yds and over; Dredge; Gradall, Crawler or tire mounted; Locomotive, Gas, Steam & other powers; Pile Driver, Land or Floating; Scoop, Skimmer; Shovel, Power (Electric, Gas, Steam or other powers); Shovel, Power (7 cu yds and over); Switch Boat; Whirley; Air Tugger with air compressor; Anchor Placing Barge; Asphalt Spreader; Athey Force Feeder Loader, self-propelled; Backfilling Machine; Boat Operator - Push Boat or Tow Boat (job site); Boiler, High Pressure Breaking in Period; Boom Truck, Placing or Erecting; Boring Machine, Footing Foundation; Bullfloat; Cherry Picker; Combination Concrete Hoist and Mixer (such as Mixermobile); Compressor, Two 125 CFM and under; Compressor, Two through Four over 125 CFM; Compressor when operator runs throttle; Concrete Breaker (Truck or Tractor mounted); Concrete Pump (such as Pumpcrete machine); Concrete Saw (self-propelled); Concrete Spreader; Conveyor, Large (not selfpropelled) hoisting or moving brick and concrete into, or into and on floor level, one or both; Crane, Climbing (such as Linden); Crane, Hydraulic - Rough Terrain, self-propelled; Crane, Hydraulic - Truck or Cruiser mounted - under 16 tons; Drilling machine - Self-powered, used for earth or rock drilling or boring (wagon drills and any hand drills obtaining power from other souces including concrete breakers, jackhammers and Barco equipmnet no engineer required); Elevating Grader; Engine Man, Dredge; Excavator or Powerbelt Machine; Finishing Machine, self-propelled oscillating screed; Forklift; Generators, Two through Six 30 KW or over; Grader, Road with power blade; Greaser; Highlift; Hoist, Concrete and Brick (Brick cages or concrete skips operating or on tower, Towermobile, or similar equipment); Hoist, Three or more drums in use; Hoist, Stack; Hydro-Hammer; Lad-A-Vator, hoisting brick or concrete; Loading Machine such as Barber-Greene; Mechanic on job site

GROUP 2: Air Tugger with plant air; Boiler (for power or heating shell of building or temporary enclosures in connection with construction work); Boiler, Temporary; Compressor, One over 125 CFM; Compressor, truck mounted; Conveyor, Large (not self-propelled); Conveyor, Large (not self-propelled) moving brick and concrete (distributing) on floor level; Curb Finishing Machine; Ditch Paving Machine; Elevator (outside); Endless Chain

Hoist; Fireman (as required); Form Grader; Hoist, One Drum regardless of size (except brick or concrete); Lad-A-Vator, other hoisting; Manlift; Mixer, Asphalt, over 8 cu ft capacity; Mixer, one bag capacity or less; Mixer, without side loader, two bag capacity or more; Mixer, with side loader, regardless of size, not Paver; Mud Jack (where mud jack is used in conjunction with an air compressor, operator shall be paid \$.55 per hour in addition to his basic hourly rate for covering both operations); Pug Mill operator; Pump, Sump - self powered, automatic controlled over 2"; Scissor Lift (used for hoisting); Skid Steer Loader; Sweeper, Street; Tractor, small wheel type 50 HP and under with grader blade and similar equipment; Welding Machine, One over 400 amp; Winch, operating from truck

GROUP 3: Boat operator - outboard motor, job site; Conveyors (such as Con-Vay-It) regardless of how used; Elevator (inside); Heater operator, 2 through 6; Sweeper, Floor

GROUP 4: Crane type

HOURLY PREMIUMS:

Backhoe, Hydraulic 2 cu yds or less without oiler - \$2.00; Certified Crane Operator - \$1.50; Certified Hazardous Material Operator \$1.50; Crane, climbing (such as Linden) - \$.50; Crane, Pile Driving and Extracting - \$.50 Crane with boom (including job) over 100 ft from pin to pin - add \$.01 per foot to maximum of \$4.00); Crane, using rock socket tool - \$.50; Derrick, diesel, gas or electric hoisting material and erecting steel (150 ft or more above ground) - \$.50; Dragline, 7 cu yds and over - \$.50; Hoist, Three or more drums in use - \$.50; Scoop, Tandem - \$.50; Shovel, Power - 7 cu yds and over - \$.50; Tractor, Tandem Crawler - \$.50; Tunnel, man assigned to work in tunnel or tunnel shaft - \$.50; Wrecking, when machines are working on second floor or higher - \$.50

ENGI0513G 05/01/2002

	Rates	Fringes
ADAIR, AUDRAIN, BOLLINGER, BOONE, BUTLER, CALLAWAY, CAPE		
GIRARDEAU, CARTER, CLARK, COLE, CRAWFORD, DENT, DUNKLIN,		
GASCONADE, HOWELL, IRON, KNOX, LEWIS, MACON, MADISON, MARIES,		
MARION, MILLER, MISSISSIPPI, MONITEAU, MONROE, MONTGOMERY,		
MORGAN, NEW MADRID, OREGON, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE,		
PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. FRANCOIS,		
STE. GENEVIEVE, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY,		
STODDARD, TEXAS, WASHINGTON, AND WAYNE COUNTIES		

POWER EQUIPMENT OPERATORS

GROUP 1	21.35	12.23
GROUP 2	21.00	12.23
GROUP 3	20.80	12.23
GROUP 4	17.15	12.23

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Asphalt finishing machine & trench widening spreader, asphalt plant console operator; autograder; automatic slipform paver; back hoe; blade operator - all types; boat operator tow; boiler two; central mix concrete plant operator; clam shell operator; concrete mixer paver; crane operator; derrick or derrick trucks; ditching machine; dozer operator; dragline operator; dredge booster pump; dredge engineman; dredge operator; drill cat with compressor mounted on cat; drilling or boring machine rotary self-propelled; highloader; hoisting engine 2 active drums; launchhammer wheel; locomotive operator standrad guage; mechanics and welders; mucking machine; piledriver operator; pitman crane operator; push cat operator; quad-trac; scoop operator; sideboom cats; skimmer scoop operator; trenching machine operator; truck crane, shovel operator.

GROUP 2: A-Frame; asphalt hot-mix silo; asphalt roller operator asphalt plant fireman (drum or boiler); asphalt plant man; asphalt plant mixer operator; backfiller operator; barber-greene loader; boat operator (bridge & dams); chip spreader; concrete mixer operator skip loader; concrete plant operator; concrete pump operator; dredge oiler; elevating graded operator; fork lift; grease fleet; hoisting engine one; locomotive operator narrow guage; multiple compactor; pavement breaker; powerbroom self-propelled; power shield; rooter; slip-form finishing machine; stumpcutter machine; side discharge concrete spreader; throttleman; tractor operator (over 50 hp); winch truck; asphalt roller operator; crusher operator.

GROUP 3: Spreader box operator, self-propelled not asphalt; tractor operator (50 h.p. or less); boilers one; chip spreader (front man); churn drill operator; compressor over 105 CFM 2-3 pumps 4" & over; 2-3 light plant 7.5 KWA or any combination thereof; clef plane operator; compressor maintenance operator 2 or 3; concrete saw operator (self-propelled); curb finishing mancine; distributor operator; finishing machine operator; flex plane operator; float operator; form grader operator; pugmill operator; riller operator other than high type asphalt; screening & washing plant operator; siphons & jets; subgrading machine operator; tank car heater (combination boiler & booster); ulmac, ulric or similar spreader; vibrating machine operator; hydrobroom.

GROUP 4: Oiler; grout machine; oiler driver; compressor over 105 CFM one; conveyor operator one; maintenance operator; pump 4" & over one.

FOOTNOTE:

HOURLY PREMIUMS

Backhoe hydraulic, 2 cu. yds. or under without oiler - \$2.00
 Certified Crane Operator - \$1.50; Certified Hazardous Material

Operator \$1.50; Crane, climbing (such as Linden) - \$0.50;
 Crane, pile driving and extracting - \$0.50; Crane, with boom
 (including jib) over 100' from pin to pin add \$0.01 per foot
 to maximum of \$4.00; Crane, using rock socket tool - \$0.50;
 Derrick, diesel, gas or electric, hoisting material and
 erecting steel (150' or more above the ground) - \$0.50;
 Dragline, 7 cu. yds, and over - \$0.50; Hoist, three or more
 drums in use - \$0.50; Scoop, Tandem - \$0.50; Shovel, power -
 7 cu. yds. or more - \$0.50; Tractor, tandem crawler - \$0.50;
 Tunnel, man assigned to work in tunnel or tunnel shaft -
 \$0.50; Wrecking, when machine is working on second floor or
 higher - \$0.50;

 ENGI0513H 05/01/2002

	Rates	Fringes
ST. LOUIS CITY AND COUNTY		
POWER EQUIPMENT OPERATORS:		
GROUP 1	24.92	12.24
GROUP 2	24.92	12.24
GROUP 3	23.02	12.24
GROUP 4	20.02	12.24
GROUP 5	19.56	12.24

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: Backhoe, cable or hydraulic; cableway; crane,
 crawler or truck; crane, hydraulic-truck or cruiser
 mounted 16 tons & over; crane locomotive; derrick,
 steam; derrick car & derrick boat; dragline; dredge;
 gradall, crawler or tire mounted; locomotive, gas,
 steam & other powers; pile driver, land or floating;
 scoop, skimmer; shovel, power (steam, gas, electric,
 or other powers); switch boat; whirley.

GROUP 2: Air tugger w/air compressor; anchor-placing
 barge; asphalt spreader; atehy force feeder loader (self-
 propelled); backfilling machine; backhoe-loader; boat
 operator-push boat or tow boat (job site); boiler,
 high pressure breaking in period; boom truck, placing
 or erecting; boring machine, footing foundation; bull-
 float; cherry picker; combination concrete hoist &
 mixer (such as mixer mobile); compressor (when operator
 runs throttle); concrete breaker (truck or tractor
 mounted); concrete pump, such as pump-crete machine;
 concrete saw (self-propelled), concrete spreader;
 conveyor, large (not self-propelled), hoisting or
 moving brick and concrete into, or into and on floor
 level, one or both; crane, hydraulic-rough terrain,
 self-propelled; crane hydraulic-truck or cruiser
 mounted-under 16 tons; drilling machines, self-powered

use for earth or rock drilling or boring (wagon drills and any hand drills obtaining power from other sources including concrete breakers, jackhammers and barco equipment-no engineer required); elevating grader; engineman, dredge; excavator or powerbelt machine; finishing machine, self-propelled oscillating screed; forklift; grader, road with power blade; highlift; greaser; hoist, stack, hydro-hammer; loading machine (such as barber-greene); machanic, on job site; mixer, pipe wrapping machines; plant asphalt; plant, concrete producing or ready-mix job site; plant heating-job site; plant mixing-job site; plant power, generating-job site; pumps, two through six self-powered over 2"; pumps, electric submersible, two through six, over 4"; quad-track; roller, asphalt, top or sub-grade; scoop, tractor drawn; spreader box; sub-grader; tie tamper; tractor-crawler, or wheel type with or without power unit, power take-offs and attachments regardless of size; trenching machine; tunnel boring machine; vibrating machine automatic, automatic propelled; welding machines (gasoline or diesel) two through six; well drilling machine

GROUP 3: Conveyor, large (not self-propelled); conveyor, large (not self-propelled) moving brick and concrete distributing) on floor level; mixer two or more mixers of one bag capacity or less; air tugger w/plant air; boiler, for power or heating on construction projects; boiler, temporary; compressor (mounted on truck; curb finishing machine; ditch paving machine; elevator; endless chain hoist; form grader; hoist, one drum regardless of size; lad-a-vator; manlift; mixer, asphalt, over 8 cu. ft. capacity, without side loader, 2 bag capacity or more; mixer, with side loader, regardless of size; pug mill operator; pump, sump-self-powered, automatic controlled over 2" during use in connection with construction work; sweeper, street; welding machine, one over 400 amp.; winch operating from truck; scissor lift (used for hoisting); tractor, small wheel type 50 h.p. & under with grader blade & similar equipment

GROUP 4: Boat operator-outboard motor (job site); conveyor (such as con-vay-it) regardless of how used; sweeper, floor

GROUP 5: Oiler on dredge and on truck crane.

HOURLY PREMIUMS:

Backhoe, hydraulic	
2 cu. yds. or under without oiler	\$2.00
Certified Crane Operator	1.50

Certified Hazardous Material Operator	1.50
Crane, climbing (such as Linden)	.50
Crane, pile driving and extracting	.50
Crane, with boom (including jib) over 100' (from pin to pin) add \$.01 per foot to maximum of	4.00
Crane, using rock socket tool	.50
Derrick, diesel, gas or electric, hoisting material and erecting steel (150' or more above ground)	.50
Dragline, 7 cu. yds. and over	.50
Hoist, three (3) or more drums in use	.50
Scoop, Tandem	.50
Shovel, power - 7 cu. yds. or more	.50
Tractor, tandem crawler	.50
Tunnel, man assigned to work in tunnel or tunnel shaft	.50
Wrecking, when machine is working on second floor or higher	.50

IRON0010M 04/01/2001

	Rates	Fringes
BUCHANAN, CASS, CLAY, JACKSON, JOHNSON, LAFAYETTE, PLATTE AND RAY Counties		
IRONWORKERS	22.70	11.63
ANDREW, ATCHISON, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDER CHARITON, CHRISTIAN, CLINTON, COOPER, DADE, DALLAS, DAVIESS, DE KALB, GENTRY, GREENE, GRUNDY, HARRISON, HENRY, HICKORY, HOLT, HOWARD, LACLEDE, LINN, LIVINGSTON, MERCER, MONITEAU, MORGAN, NODAWAY, PETTIS, POLK, PUTNAM, RANDOLPH, ST. CLAIR, SALINE, SULLIVAN, TANEY, VERNON, WEBSTER, WRIGHT and WORTH Counties; and portions of ADAIR, BOONE, MACON, MILLER, and RANDOLPH Counties		
IRONWORKERS	19.70	11.63

IRON0321C 05/01/2002

	Rates	Fringes
DOUGLAS, HOWELL and OZARK COUNTIES		
IRONWORKERS	17.70	8.01

IRON0396D 08/01/2001

	Rates	Fringes
ST. LOUIS (City and County), ST. CHARLES, JEFFERSON, IRON, FRANKLIN, LINCOLN, WARREN, WASHINGTON, ST. FRANCOIS, STE. GENEVIEVE, and REYNOLDS Counties; and portions of MADISON, PERRY, BOLLINGER, WAYNE, and CARTER Counties		
IRONWORKERS	25.34	11.42

IRON0396I	08/01/2001	
	Rates	Fringes
AUDRAIN, CALLAWAY, COLE, CRAWFORD, DENT, GASCONADE, MARIES, MONTGOMERY, OSAGE, PHELPS, PIKE, PULASKI, TEXAS, and WRIGHT Counties; and portions of CAMDEN, DOUGLAS, HOWELL, MILLER, OREGON, BOONE, SHANNON, LACLEDE, MONROE, and RALLS Counties		
IRONWORKERS	20.56	11.29

IRON0577F	06/01/2001	
	Rates	Fringes
ADAIR, CLARK, KNOX, LEWIS, MACON, MARION, MONROE, RALLS, SCHUYLER, SCOTLAND, AND SHELBY COUNTIES		
IRONWORKERS	19.85	9.06

IRON0584E	06/01/2001	
	Rates	Fringes
BARRY, JASPER, LAWRENCE, MCDONALD, NEWTON AND STONE Counties		
IRONWORKERS	18.20	7.87

IRON0782D	05/01/2001	
	Rates	Fringes
CAPE GIRARDEAU, MISSISSIPPI, NEW MADRID, SCOTT, & STODDARD Counties; and portions of BOLLINGER, BUTLER, CARTER, DUNKLIN, MADISON, PEMISCOT, PERRY, RIPLEY, and WAYNE Counties		
IRONWORKERS:		
All Major River Work		
(Dams, Bridges):		
Projects \$20 million or more		
	20.65	9.88
All Other Work		
	19.55	9.11

LABO0042C	03/04/2002	
	Rates	Fringes
ST. LOUIS (City and County)		
LABORERS:		
Plumber Laborers	23.30	7.10

LABO0042H	03/06/2002	
	Rates	Fringes
ST. LOUIS (City and County)		
LABORERS:		
Laborers, Flagperson	23.11	7.10
Wrecking	22.99	7.10
Dynamiter, Powderman	23.61	7.10

LABO0424B	05/01/2002	

	Rates	Fringes
FRANKLIN COUNTY		
LABORERS		
GROUP 1	21.65	6.40
GROUP 2	22.25	6.40
JEFFERSON COUNTY		
LABORERS		
GROUP 1	21.70	6.40
GROUP 2	22.30	6.40
ADAIR, AUDRAIN, BOLLINGER, BOONE, BUTLER, CALLAWAY, CAPE GIRARDEAU, CARTER, CHARITON, CLARK, COLE, COOPER, CRAWFORD, DENT, DUNKLIN, GASCONADE, HOWARD, HOWELL, IRON, KNOX, LEWIS, LINN, MACON, MADISON, MARIES, MARION, MILLER, MISSISSIPPI, MONITEAU, MONROE, NEW MADRID, OREGON, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, RANDOLPH, REYNOLDS, RIPLEY, ST. FRANCOIS, STE. GENEVIEVE, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY, STODDARD, SULLIVAN, TEXAS, WASHINGTON, AND WAYNE COUNTIES		
LABORERS		
GROUP 1	20.20	6.40
GROUP 2	20.80	6.40
LINCOLN, MONTGOMERY AND WARREN COUNTIES		
LABORERS		
GROUP 1	20.45	6.40
GROUP 2	21.05	6.40

LABORERS CLASSIFICATIONS

GROUP 1 - General laborer-flagman, carpenter tenders; salamander Tenders; Dump Man; Ticket Takers; loading trucks under bins, hoppers, and conveyors; track man; cement handler; dump man on earth fill; georgie buggy man; material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams; riprap pavers rock, block or brick; scaffolds over ten feet not self-supported from ground up; skip man on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters, puddlers (paving only); straw blower nozzle man; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizers, board and willow mat weavers and cabelee tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft. where compressed air is not used; abutement and pier hole men working six (6) ft. or more below ground; men working in coffer dams for bridge piers and footing in the river; barco tamper; jackson or any other similar

tamp; cutting torch man; liners, curb, gutters, ditch lines; hot mastic kettlemen; hot tar applicator; hand blade operator; mortar men or brick or block manholes; rubbing concrete, air tool operator under 65 lbs.; caulker and lead man; chain or concrete saw under 15 h.p.; signal Gan; Guard rail and sign erectors. GROUP 2 - Skilled laborers - Vibrator man; asphalt raker; head pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from bosun's chairs; scaffolds or platforms on dams or power plants over 10 ft. high; air tool operator over 65 lbs.; stringline man on concrete paving; sandblast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills, gunite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 h.p. and over; grade checker; strigline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi or over; asbestos and/or hazardous waste removal and/or disposal

LABO0579F 05/01/2001

	Rates	Fringes
BUCHANAN AND LAFAYETTE COUNTIES		
LABORERS		
GROUP 1	18.04	6.29
GROUP 2	18.39	6.29
ANDREW, ATCHISON, BARRY, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDAR, CHRISTIAN, CLINTON, DADE, DALLAS, DAVIESS, DEKALB, DOUGLAS, GREENE, GENTRY, GRUNDY, HARRISON, HENRY, HICKORY, HOLT, JASPER, JOHNSON, LACLEDE, LAWRENCE, LIVINGSTON, MCDONALD, MERCER, MORGAN, NEWTON, NODAWAY, OZARK, PETTIS, POLK, ST. CLAIR, SALINE, STONE, TANEY, VERNON, WEBSTER, WORTH AND WRIGHT COUNTIES.		
LABORERS		
GROUP 1	16.69	6.04
GROUP 2	17.24	6.04

LABORERS CLASSIFICATIONS

GROUP 1: General Laborers - Carpenter tenders; salamander tenders; loading trucks under bins; hoppers & conveyors; track men & all other general laborers; air tool operator; cement handler-bulk or sack; dump man on earth fill; georgie buggy man; material batch hopper man; material mixer man (except on manholes); coffer dams; riprap pavers - rock, block or brick; signal man; scaffolds over ten feet not self-supported from ground up; skipman on concrete paving; wire mesh setters on concrete paving; all work in connection with sewer, water, gas, gasoline, oil drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator, all work in connection with hydraulic or general dredging operations;

puddlers (paving only); straw blower nozzle man; asphalt plant platform man; chuck tender; crusher feeder; men handling creosote ties or creosote materials; men working with and handling epoxy material or materials (where special protection is required); rubbing concrete; topper of standing trees; batter board man on pipe and ditch work; feeder man on wood pulverizers; board and willow mat weavers and cable tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 feet where compressed air is not used; abutment and pier hole men working six (6) feet or more below ground; men working in coffer dams for bridge piers and footings in the river; ditchliners; pressure groutmen; caulker; chain or concrete saw; cliffscalers working from scaffolds, bosuns' chairs or platforms on dams or power plants over (10) feet above ground; mortarmen on brick or block manholes; toxic and hazardous waste work.

GROUP 2: Skilled Laborers - Head pipe layer on sewer work; laser beam man; Jackson or any other similar tamp; cutting torch man; form setters; liners and stringline men on concrete paving, curb, gutters; hot mastic kettleman; hot tar applicator; sandblasting and gunite nozzle men; air tool operator in tunnels; screed man on asphalt machine; asphalt raker; barco tamper; churn drills; air track drills and all similar drills; vibrator man; stringline man for electronic grade control; manhole builders-brick or block; dynamite and powder men; grade checker.

LABO0660H 03/06/2002

	Rates	Fringes
ST. CHARLES COUNTY		
LABORERS:		
GROUP 1	22.37	6.49
GROUP 2	22.37	6.49

LABORERS CLASSIFICATIONS

GROUP 1: General laborer; carpenter tender; salamander tender; dump man; ticket takers; flagman; loading trucks under bins, hoppers, and conveyors; track men; cement handler; dump man on earth fill; Georgie buggy man; material batch hopper man; spreader on asphalt machine; material mixer man (except on manholes); coffer dams; riprap paver - rock, block, or brick; signal man; scaffolds over 10 ft not self-supported from ground up; skipman on concrete paving; wire mech setters on concrete paving; all work in connection with sewer, water, gas, gasoline, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipe lines; power tool operator; all work in connection with hydraulic or general dredging operations; form setters; puddlers (paving only); straw blower nozzle man; asphalt plant platform man; chuck tender; crusher feeder; men

handling creosote ties or creosote materials; men working with and handling epoxy material; topper of standing trees; feeder man on wood pulverizer; board and w llow mat weavers and cable tiers on river work; deck hands; pile dike and revetment work; all laborers working on underground tunnels less than 25 ft where compressed air is not used; abutment and pier hole men working 6 ft or more below ground; men working in coffer dams for bridge piers and footings in the river; Barco tamper, Jackson or any other similar tamp; cutting torch man; liners, curb, gutters, ditchliners; hot mastic kettleman; hot tar applicator; hand blade operators; mortar men on brick or block manholes; rubbing concrete; air tool operator under 65 pounds; caulker and lead man; chain saw under 15 hp; guard rail and sign erectors

GROUP 2: Vibrator man; asphalt raker; hand pipe layer on sewer work; batterboard man on pipe and ditch work; cliff scalers working from Bosun's chairs, scaffolds or platforms on dams or power plants over 10 ft high; air tool operator over 65 pounds; stringline man on concrete paving etc.; sand blast man; laser beam man; wagon drill; churn drill; air track drill and all other similar type drills; gunnite nozzle man; pressure grout man; screed man on asphalt; concrete saw 15 hp and over; grade checker; stringline man on electronic grade control; manhole builder; dynamite man; powder man; welder; tunnel man; waterblaster - 1000 psi and over; asbestos and/or hazardous waste removal and or disposal;

LABO0663D 04/01/2002

	Rates	Fringes
CASS, CLAY, JACKSON, PLATTE AND RAY COUNTIES		
LABORERS:		
GROUP 1	21.05	7.24
GROUP 2	22.14	7.24

LABORERS CLASSIFICATIONS

GROUP 1: General laborers, Carpenter tenders, salamander tenders, loading trucks under bins, hoppers and conveyors, track men and all other general laborers, air tool operator, cement handler (bulk or sack), chain or concrete saw, deck hands, dump man on earth fill, Georgie Buggies man, material batch hopper man, scale man, material mixer man (except on manholes), coffer dams, abutments and pier hole men working below ground, riprap pavers rock, black or brick, signal man, scaffolds over ten feet not self-supported from ground up, skipman on concrete paving, wire mesh setters on concrete paving, all work in connection with sewer, water, gas, gasoling, oil, drainage pipe, conduit pipe, tile and duct lines and all other pipelines, power tool operator, all work in connection with hydraulic or general dredging

operations, straw blower nozzle man, asphalt plant platform man, chuck tender, crusher feeder, men handling creosote ties on creosote materials, men working with and handling epoxy material or materials (where special protection is required), topper of standing trees, batter board man on pipe and ditch work, feeder man on wood pulverizers, board and willow mat weavers and cable tiers on river work, deck hands, pile dike and revetment work, all laborers working on underground tunnels less than 25 feet where compressed air is not used, abutment and pier hole men working six (6) feet or more below ground, men working in coffer dams for bridge piers and footings in the river, ditchliners, pressure groutmen, caulker and chain or concrete saw, cliffscalers working from scaffolds, bosuns' chairs or platforms on dams or power plants over (10) feet above ground, mortarmen on brick or block manholes, signal man.

GROUP 2: Skilled Laborer - spreader or screed man on asphalt machine, asphalt raker, grade checker, vibrator man, concrete saw over 5 hp., laser beam man, barco tamper, jackson or any other similar tamp, wagon driller, churn drills, air track drills and other similar drills, cutting torch man, form setters, liners and stringline men on concrete paving, curb, gutters and etc., hot mastic kettleman, hot tar applicator, hand blade operators, mortar men on brick or block manholes, sand blasting and gunnite nozzle men, rubbing concrete, air tool operator in tunnels, head pipe layer on sewer work, manhole builder (brick or block), dynamite and powder men.

PAIN0002B 09/01/2001

	Rates	Fringes
CLARK, FRANKLIN, JEFFERSON, LEWIS, LINCOLN, MARION, PIKE, RALLS, ST. CHARLES, ST. LOUIS (CITY & COUNTY), AND WARREN COUNTIES		

PAINTERS:

Brush	23.93	7.35
Spray	25.93	7.35

PAIN0002G 04/17/2001

	Rates	Fringes
ADAIR, AUDRAIN, BOONE, CALLAWAY, CHARITON, COLE, GASCONADE, HOWARD, KNOX, LINN, MACON, MONROE, MONTGOMERY, OSAGE, PUTNAM, RANDOLPH, SCHUYLER, SCOTLAND, SHELBY AND SULLIVAN COUNTIES and the City of Booneville.		

PAINTERS:

Brush, Roller, Paperhanger, Tapers	16.94	6.31
Tapers using Ames or comparable tools (bazooks, etc.)	17.19	6.31
Spray; Water Base Epoxy;		

Stage Under 50 ft.;		
Structural Steel (except for		
stairs and railings)	17.44	6.31
Sandblasting; Epoxy or Any		
Two Part Coating; Stage or		
Other Aerial Work Platforms		
Over 50 ft. high;		
Lead Abatement	17.94	6.31
Bridges, Dams, Locks or		
Powerhouses	18.94	6.31

PAIN0003D 04/01/2000

	Rates	Fringes
BATES, BENTON, CALDWELL, CARROLL, CASS, CLAY, CLINTON, COOPER,		
DAVISS, GRUNDY, HARRISON, HENRY, JACKSON, JOHNSON, LAFAYETTE,		
LIVINGSTON, MERCER, MONITEAU, MORGAN, PETTIS, PLATTE, RAY AND		
SALINE COUNTIES		

PAINTERS:

Brush & Roller; Taper	22.10	6.01
Bazooka; Paperhanger	22.60	6.01
Storage Bin & Tanks (Roller or		
Brush); Elevated Tanks (Roller		
or Brush); Stageman; Beltman;		
Bridgeman; Steelman; Sand Blast		
(Base); Elevator Shaft	22.85	6.01
Lead Abatement; Sprayman	23.10	6.01
Sandblast (Bridge, Stage, Erected		
Steel and Storage Bin and Tanks)	23.60	6.01
Sprayman (Storage Bin & Tanks,		
Elevated Tanks); Stageman (Spray);		
Bridgeman (Spray); Steelman		
(Spray)	23.85	6.01
Steeplejack (other than Elevated		
Tanks)	26.79	6.01
Steeplejack -Spray or Sandblast		
(other than Elevated Tanks)	27.79	6.01

PAIN0098B 05/01/2000

	Rates	Fringes
ANDREW, ATCHISON, BUCHANAN, DE KALB, GENTRY, HOLT, NODAWAY &		
WORTH COUNTIES		

PAINTERS:

Brush & Roller	20.50	4.40
Sandblasters	21.50	4.40
Steeple Jack	23.50	4.40

PAIN0203B 04/01/1999

	Rates	Fringes
BARRY, BARTON, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, HOWELL, JASPER, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, ST. CLAIR, STONE, TANEY, VERNON, WEBSTER and WRIGHT COUNTIES		

PAINTERS:

Sandblasters & Highman (over 40')	17.68	3.23
Painters	17.38	3.23
Tapers	16.47	3.21

PAIN1265C 07/01/2001

	Rates	Fringes
CAMDEN, CRAWFORD, DENT, LACLEDE, MARIES, MILLER, PHELPS, PULASKI AND TEXAS COUNTIES		

PAINTERS:

Brush and Roller, Spray	17.54	7.37
Structural Steel, Sandblasting and all Tank Work	18.79	7.37
Lead Abatement	19.79	7.37

PAIN1292B 07/01/2001

	Rates	Fringes
BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, MISSISSIPPI, NEW MADRID, OREGON, PEMISCOT, PERRY, REYNOLDS, RIPLEY, SCOTT, SHANNON, STODDARD and WAYNE COUNTIES		

PAINTERS:

Commercial	15.44	5.97
Industrial	17.94	5.97
Bridges, Stacks & Tanks	22.89	5.97
Taper (Tools)	15.69	5.97
Spray & Abrasive Blasting	17.44	5.97
Waterblasting	17.44	5.97

Height Rates (All Areas): Over 60 ft. \$0.50 per hour.

Under 60 ft. \$0.25 per hour.

PAIN1292F 07/01/2001

	Rates	Fringes
IRON, MADISON, ST. FRANCOIS, STE. GENEVIEVE and WASHINGTON COUNTIES		

PAINTERS:

Commercial	17.54	5.97
Industrial	18.54	5.97
Tapers (Tools)	17.79	5.97
Bridges, Stacks & Tanks	22.89	5.97
Spray & Abrasive Blasting	19.54	5.97
Waterblasting	19.54	5.97

Lead Abatement 18.29 5.97
 Height Rates (All Areas): Over 60 ft. \$0.50 per hour
 Under 60 ft. \$0.25 per hour.

 PLAS0518F 04/01/2002

	Rates	Fringes
BARRY, BARTON, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HOWELL, JASPER, LACLEDE, LAWRENCE, MCDONALD, NEWTON, OZARK, POLK, STONE, TANEY, VERNON, WEBSTER, AND WRIGHT COUNTIES CEMENT MASONS	17.31	3.84

 PLAS0518G 04/01/2001

	Rates	Fringes
CASS (Richards-Gebaur AFB only), CLAY, JACKSON, PLATTE AND RAY COUNTIES CEMENT MASONS	21.25	8.15

 PLAS0518K 05/01/2001

	Rates	Fringes
ANDREW, ATCHISON, BUCHANAN, BATES, CALDWELL, CARROLL, CASS (Except Richards-Gebaur AFB) CLINTON, DAVIESS, DEKALB, GENTRY, GRUNDY, HARRISON, HOLT, JACKSON, LAFAYETTE, LIVINGSTON, MACON, MERCER, NODAWAY AND WORTH COUNTIES CEMENT MASONS	23.13	7.15

 PLAS0527A 05/01/2001

	Rates	Fringes
JEFFERSON, ST. CHARLES COUNTIES AND ST. LOUIS (City and County) CEMENT MASONS	24.48	8.85
FRANKLIN, LINCOLN, AND WARREN COUNTIES CEMENT MASONS	23.31	8.85

 PLAS0527D 06/01/2001

	Rates	Fringes
CRAWFORD, DENT, IRON, MADISON, MARION, PHELPS, PIKE, PULASKI, RALLS, REYNOLDS, ST. FRANCOIS, STE. GENEVIEVE, SHANNON, TEXAS, WASHINGTON COUNTIES CEMENT MASONS	22.00	8.76

 PLAS0908A 05/01/2002

	Rates	Fringes
BOLLINGER, BUTLER, CAPE GIRARDEAU, CARTER, DUNKLIN, MISSISSIPPI, NEW MADRID, OREGON, PEMISCOT, PERRY, RIPLEY, SCOTT, STODDARD, AND WAYNE COUNTIES CEMENT MASONS	17.40	8.95

PLAS0908G 03/01/2001		
	Rates	Fringes
BENTON, CALLAWAY, CAMDEN, COLE, GASCONADE, HENRY, HICKORY, JOHNSON, MARIES, MILLER, MONTGOMERY, MORGAN, OSAGE, PETTIS, SALINE & ST. CLAIR COUNTIES		
CEMENT MASONS	18.61	5.65

PLUM0008C 06/01/2000		
	Rates	Fringes
CASS, CLAY, JACKSON, JOHNSON, PLATTE COUNTIES		
PLUMBERS	26.44	9.87
BATES, BENTON, CARROLL, HENRY, LAFAYETTE, MORGAN, PETTIS, RAY, ST. CLAIR, SALINE, AND VERNON COUNTIES		
PLUMBERS	24.00	9.87

PLUM0035C 01/01/2000		
	Rates	Fringes
CAMDEN, COLE, CRAWFORD, FRANKLIN, JEFFERSON, MARIES, MILLER, MONITEAU, OSAGE, PHELPS, PULASKI, ST. CHARLES, ST. LOUIS (City and County), WARREN and WASHINGTON COUNTIES		
PLUMBERS	26.105	9.74

PLUM0045D 12/15/2001		
	Rates	Fringes
ANDREW, ATCHISON, BUCHANAN, CALDWELL, CLINTON, DAVIESS, DEKALB, GENTRY, HARRISON, HOLT, NODAWAY AND WORTH COUNTIES		
PLUMBERS & PIPEFITTERS	26.85	9.80

PLUM0178D 11/01/2001		
	Rates	Fringes
BARRY, CEDAR, CHRISTIAN, DADE, DALLAS, DOUGLAS, GREENE, HICKORY, LACLEDE, LAWRENCE, POLK, STONE, TANEY, WEBSTER, AND WRIGHT COUNTIES		
PLUMBERS & PIPEFITTERS	22.10	7.37

PLUM0317B 07/01/1995		
	Rates	Fringes
BOONE, CALLAWAY, COOPER, HOWARD, AND RANDOLPH COUNTY (Southern half)		
PLUMBERS & PIPEFITTERS	19.18	3.17

PLUM0533E 06/01/2001		
	Rates	Fringes
BATES, BENTON, CARROLL, CASS, CLAY, HENRY, HICKORY, JACKSON, JOHNSON, LAFAYETTE, MORGAN, PETTIS, PLATTE, RAY, SALINE, ST. CLAIR AND VERNON COUNTIES		
PIPEFITTERS	28.38	11.08

PLUM0562D 07/01/2001

	Rates	Fringes
ADAIR, AUDRAIN, BOLLINGER, BUTLER, CAMDEN, CAPE GIRARDEAU, CARTER, CHARITON, CLARK, COLE, CRAWFORD, DENT, DUNKLIN, FRANKLIN, GASCONADE, GRUNDY, HOWELL, IRON, JEFFERSON, KNOX, LEWIS, LINCOLN, LINN, LIVINGSTON, MACON, MADISON, MARIES, MARION, MERCER, MILLER, MISSISSIPPI, MONITEAU, MONROE, MONTGOMERY, NEW MADRID, NORTHERN HALF OF RANDOLPH, OREGON, OSAGE, PEMISCOTT, PERRY, PHELPS, PIKE, PULASKI, PUTNAM, RALLS, REYNOLDS, RIPLEY, ST. CHARLES, ST. FRANCOIS, STE. GENEVIEVE, ST. LOUIS, SCHUYLER, SCOTLAND, SCOTT, SHANNON, SHELBY, STODDARD, SULLIVAN, TEXAS, WARREN, WASHINGTON, AND WAYNE COUNTIES.		
PIPEFITTERS	27.75	11.83

PLUM0658B 07/01/1998

	Rates	Fringes
BARTON, JASPER, MCDONALD, AND NEWTON COUNTIES		
PLUMBERS & PIPEFITTERS	16.73	5.33

TEAM0013H 05/01/2001

	Rates	Fringes
AUDRAIN, BOLLINGER, BOONE, CALLAWAY, CAPE GIRARDEAU, CARTER, COLE, CRAWFORD, DENT, GASCONADE, IRON, MACON, MADISON, MARIES, MARION, MILLER, MISSISSIPPI, MONROE, MONTGOMERY, NEW MADRID, OSAGE, PEMISCOT, PERRY, PHELPS, PIKE, PULASKI, RALLS, REYNOLDS, ST. FRANCOIS, STE. GENEVIEVE, SCOTT, SHANNON, SHELBY, STODDARD, TEXAS, WASHINGTON, AND WAYNE COUNTIES		

TRUCK DRIVERS:

GROUP 1	21.72	5.25
GROUP 2	21.87	5.25
GROUP 3	21.88	5.25
GROUP 4	21.99	5.25

ADAIR, BUTLER, CLARK, DUNKIN, HOWELL, KNOX, LEWIS, OREGON, PUTNAM, RIPLEY, SCHUYLER, AND SCOTLAND COUNTIES

TRUCK DRIVERS:

GROUP 1	20.99	5.25
GROUP 2	21.14	5.25
GROUP 3	21.15	5.25
GROUP 4	21.26	5.25

TRUCK DRIVERS CLASSIFICATIONS:

GROUP 1: Flat Bed Trucks, Single Axle; Station Wagons; Pickup Trucks; Material Trucks, Single Axle; Tank Wagon, Single Axle

GROUP 2: Agitator and Transit Mix Trucks

GROUP 3: Flat Bed Trucks, Tandem Axle; Articulated Dump Trucks; Material Trucks, Tandem Axle; Tank Wagon,

Tandem Axle

GROUP 4: Semi and/or Pole Trailers; Winch, Fork & Steel Trucks; Distributor Drivers and Operators; Tank Wagon, Semi-Trailer; Insley Wagons, Dumpsters, Half-Tracks, Speedace, Euclids and other similar equipment; A-Frame and Derrick Trucks; Float or Low Boy

TEAM0056A 05/01/1998

BUCHANAN, CASS (Except Richards-Gebaur AFB), JOHNSON, AND
LAFAYETTE COUNTIES

TRUCK DRIVERS:

	Rates	Fringes
GROUP 1	20.13	4.75
GROUP 2	20.24	4.75
GROUP 3	20.28	4.75
GROUP 4	20.35	4.75

ANDREW, BARTON, BATES, BENTON, CALDWELL, CAMDEN, CARROLL, CEDAR, CHARITON, CHRISTIAN, CLINTON, COOPER, DADE, DALLAS, DAVIESS, DEKALB, DOUGLAS, GREENE, HENRY, HICKORY, HOWARD, JASPER, LACLEDE, LAWRENCE, LINN, LIVINGSTON, MONITEAU, MORGAN, NEWTON, PETTIS, POLK, RANDOLPH, ST CLAIR, SALINE, VERNON, WEBSTER, AND WRIGHT COUNTIES

TRUCK DRIVERS:

GROUP 1	18.92	4.75
GROUP 2	19.07	4.75
GROUP 3	19.08	4.75
GROUP 4	19.19	4.75

ATCHISON, BARRY, GENTRY, GRUNDY, HARRISON, HOLT, MCDONALD, MERCER, NODADWAY, OZARK, STONE, SULLIVAN, TANEY AND WORTH COUNTIES

TRUCK DRIVERS:

GROUP 1	18.19	4.75
GROUP 2	18.34	4.75
GROUP 3	18.35	4.75
GROUP 4	18.46	4.75

TRUCK DRIVER CLASSIFICATIONS

GROUP 1: Flat bed trucks single axle; station wagons; pickup trucks; material trucks single axle; tank wagons single axle.

GROUP 2: Agitator and transit mix-trucks.

GROUP 3: Flat bed trucks tandem axle; articulated dump trucks; material trucks tandem axle; tank wagons tandem axle.

GROUP 4: Semi and/or pole trailers; winch, fork & steel trucks; distributor drivers & operators; tank wagons semi-trailer; insley wagons, dumpsters, half-tracks, speedace, euclids & other similar equipment;

A-frames and derrick trucks; float or low boy.

TEAM0245C 03/25/1998

	Rates	Fringes
BARRY, BARTON, CAMDEN, CEDAR, CHRISTIAN, DALLAS, DENT, DOUGLAS, GREENE, HICKORY, HOWELL, JASPER, LACLEDE, LAWRENCE, MCDONALD, MILLER, NEWTON, OZARK, PHELPS, POLK, PULASKI, SHANNON, STONE, TANEY, TEXAS, VERNON, WEBSTER AND WRIGHT COUNTIES		

TRUCK DRIVERS:

Traffic Control Service Driver	12.90	3.56+a
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PAID HOLIDAYS: New Year's Day, Decoration Day, July 4th,

Labor Day, Thanksgiving Day, Christmas Day,

Employee's birthday and 2 personal days.

* TEAM0541A 04/01/2002

	Rates	Fringes
CASS (Richards-Gebaur AFB), CLAY, JACKSON, PLATTE, AND RAY COUNTIES		

TRUCK DRIVERS:

GROUP 1	22.89	6.75
GROUP 2	22.38	6.75
GROUP 3	21.89	6.75

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Mechanics and Welders, Field; A-Frame Low Boy-Boom
Truck Driver.

GROUP 2: Articulated Dump Truck; Insley Wagons: Dump Trucks,
Excavating, 5 cu yds and over; Dumpsters; Half-Tracks:

Speedace: Euclids & similar excavating equipment.

Material trucks, Tandem Two teams; Semi-Trailers;

Winch trucks-Fork trucks; Distributor Drivers

and Operators; Agitator and Transit Mix; Tank Wagon

Drivers, Tandem or Semi; One Team; Station Wagons;

Pickup Trucks; Material Trucks, Single Axle; Tank

Wagon Drivers, Single Axle

GROUP 3: Oilers and Greasers - Field

TEAM0541C 03/25/2000

	Rates	Fringes
BATES, CASS, CLAY, HENRY, JACKSON, JOHNSON, LAFAYETTE, PLATTE, AND RAY COUNTIES		

TRUCK DRIVERS:

Traffic Control Service Driver	14.15	2.44+a
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a. PAID HOLIDAYS: New Year's Day, Decoration Day, July 4th,

Labor Day, Thanksgiving Day, Christmas Day,

Employee's birthday and 2 personal days.

TEAM0682D 05/01/2000

	Rates	Fringes
ST LOUIS CITY AND COUNTY		
TRUCK DRIVERS:		
GROUP 1	21.105	4.76+a+b
GROUP 2	21.305	4.78+a+b
GROUP 3	21.405	4.79+a+b

a. PENSION: \$18.80 per day, \$94.00 maximum per week.

b. HAZMAT PREMIUM: If Hazmat certification on a job site is required by a state or federal agency or requested by project owner or by the employer, employees on that job site shall receive \$1.50 premium pay.

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1 - Pick-up trucks; forklift, single axle; flatbed trucks; job site ambulance, and trucks or trailers of a water level capacity of 11.99 cu. yds. or less

GROUP 2 - Trucks or trailers of a water level capacity of 12.0 cu yds. up to 22.0 cu yds. including euclids, speedace and similar equipment of same capacity and compressors

GROUP 3 - Trucks or trailers of a water level capacity of 22.0 cu. yds & over including euclids, speedace & all floats, flatbed trailers, boom trucks, winch trucks, including small trailers, farm wagons tilt-top trailers, field offices, tool trailers, concrete pumps, concrete conveyors & gasoline tank trailers and truck mounted mobile concrete mixers

FOOTNOTE FOR TRUCK DRIVERS:

a. PAID HOLIDAYS: Christmas Day, Independence Day, Labor Day, Memorial Day, Veterans Day, New Years Day, Thanksgiving Day

PAID VACATION: 3 days paid vacation for 600 hours of service in any one contract year; 4 days paid vacation for 800 hours of service in any one contract year; 5 days paid vacation for 1,000 hours of services in any one contract years.

TEAM0682E 05/01/2000

	Rates	Fringes
ST.CHARLES, FRANKLIN, JEFFERSON, LINCOLN AND WARREN COUNTIES:		
TRUCK DRIVERS:		
GROUP 1	21.105	3.29+a+b+c
GROUP 2	21.305	3.29+a+b+c
GROUP 3	21.405	3.29+a+b+c

a. PAID HOLIDAYS: Christmas, Fourth of July, Labor Day, Memorial Day, Veterans Day, to be celebrated on either its National Holiday or on the day after Thanksgiving, whichever is agreed upon by the Association and the Union, New Year's Day and Thanksgiving Day.

- b. Pension: \$18.80 per day either worked or compensated to a maximum of \$94.00 per week.
- c. Hazmat Pay: If Hazmat Certification on a job site is required by a state or federal agency or requested by project owner or by the employer, employees on that job site shall receive \$1.50 per hour premium pay.

TRUCK DRIVER CLASSIFICATIONS:

- GROUP 1: Trucks or Trailers of a Water Level Capacity of 11.99 cu. yds. or less, Forklift Trucks, Job Site Ambulances, Pickup Trucks, Flatbed Trucks.
- GROUP 2: Trucks or Trailers of a Water Level Capacity of 12.0 cu. yds. up to 22 cu. yds., Euclids, Speedace and Similar Equipment of Same Capacity and Compressors.
- GROUP 3: Trucks or Trailers of a Water Level Capacity of 22.0 cu. yds. and over, Euclids and all Floats, Flatbed Trailers, Boom Trucks, Winch Trucks, Including Small Trailers, Farm Wagons, Tilt Top Trailers, Tool Trailers, Concrete Pumps, Concrete Conveyors, Gasoline Tank Trailers, Truck Mounted Mobile Concrete Mixers, End Dump, Side Dump and Articulated Dump Trucks.

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the

Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

General Decision Number MO020018

General Decision Number MO020018

Superseded General Decision No. MO010018 State: Missouri

Construction Type:

BUILDING

County(ies):

BOLLINGER	MISSISSIPPI	SCOTT
BUTLER	NEW MADRID	SHANNON
CARTER	OREGON	STODDARD
DUNKLIN	PEMISCOT	TEXAS
MADISON	RIPLEY	WAYNE

BUILDING CONSTRUCTION PROJECTS (Does not include single family homes and apartments up to and including 4 stories)

Modification Number Publication Date

0	03/01/2002
1	05/03/2002
2	06/07/2002

COUNTY(ies):

BOLLINGER	MISSISSIPPI	SCOTT
BUTLER	NEW MADRID	SHANNON
CARTER	OREGON	STODDARD
DUNKLIN	PEMISCOT	TEXAS
MADISON	RIPLEY	WAYNE

CARP0011B 05/01/2000

	Rates	Fringes
CARPENTERS (Including Drywall Hanging)		
MADISON, SHANNON AND TEXAS COUNTIES	21.73	5.40
BOLLINGER, BUTLER, DUNKLIN, MISSISSIPPI, NEW MADRID, PEMISCOT, SCOTT, STODDARD AND WAYNE COUNTIES	22.46	4.72
CARTER, OREGON AND RIPLEY COUNTIES	21.54	4.72

* ELEC0001C 06/01/2002

	Rates	Fringes
ELECTRICIANS	29.20	15.64

ENGI0513A 05/01/2002

	Rates	Fringes
POWER EQUIPMENT OPERATORS:		
Backhoes	22.27	12.26
Cranes	22.27	12.26
HOURLY PREMIUMS:		

Backhoe Hydraulic, 2 cu. yds. or under without oiler \$2.00
 Certified Crane Operator \$1.50
 Crane Climbing (such as Linden); Crane, Pile Driving and
 Extracting; Crane with boom (including jib) over 100'
 from pin to pin add \$0.01 per foot to maximum of \$4.00;
 Crane, using Rocket Socket Tool \$0.50

IRON0396G 08/01/2001

	Rates	Fringes
IRONWORKERS:		
Bollinger (N.W. Corner), Madison (Remainder of County) and portions of Carter and Wayne Counties	25.34	11.42

IRON0396H 08/01/2001

	Rates	Fringes
TEXAS County and portions of OREGON and SHANNON Counties IRONWORKERS	20.56	11.29

IRON0782I 05/01/2001

	Rates	Fringes
IRONWORKERS:		
Bollinger (Remainder of County) Madison County (S.E. Portion)	19.55	9.11

SFMO0669A 04/01/2000

	Rates	Fringes
SPRINKLER FITTERS	26.59	7.45

SHEE0036K 09/01/1999

	Rates	Fringes
SHEET METAL WORKERS (Including HVAC Duct Work)	25.86	10.25

SUMO1034A 04/17/2000

	Rates	Fringes
LABORERS, UNSKILLED	11.64	3.72
PAINTERS, BRUSH & ROLLER (Excluding Drywall Finishing)	14.76	3.37
PLUMBERS (Including HVAC Piping Work)	16.93	4.67
ROOFERS	11.69	

WELDERS - Receive rate prescribed for craft performing operation
 to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(v)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an

interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

**NEW MADRID RIVERFRONT IMPROVEMENTS
TECHNICAL TABLE OF CONTENTS**

<u>SECTION NO.</u>	<u>DESCRIPTION</u>
00800b	SPECIAL CONTRACT REQUIREMENTS, SAFETY SIGN STORM WATER POLLUTION PREVENTION PLAN
DIVISION 1 - GENERAL REQUIREMENTS	
01090b	SOURCES FOR REFERENCE PUBLICATIONS
01130b	ENVIRONMENTAL PROTECTION
01270b	MEASUREMENT AND PAYMENT
01330b	SUBMITTAL PROCEDURES
01356b	STORMWATER POLLUTION PREVENTION MEASURES
01450b	PROJECT SIGNS, BARRICADES AND TRAFFIC CONTROL SIGNS
01451b	CONTRACTOR QUALITY CONTROL
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02216b	STONE PROTECTION
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02231b	DEMOLITION
02234b	DEBRIS CLEAN UP
02300b	EARTHWORK
02370b	SOIL SURFACE EROSION CONTROL
02378b	GEOTEXTILES
02710b	ASPHALTIC CONCRETE PAVEMENT
02722b	AGGREGATE BASE COURSE
02754b	CONCRETE PAVEMENT
02763b	PAVEMENT MARKINGS
02782b	BRICK PAVERS
02832b	SEGMENTAL CONCRETE BLOCK RETAINING WALL
02871b	SITE FURNISHINGS
02922b	SODDING
02930b	EXTERIOR PLANTING
DIVISION 3 - CONCRETE	
03100b	STRUCTURAL CONCRETE FORMWORK
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05720b	HANDRAILS
DIVISION 6 THRU DIVISION 8 – NOT USED	
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**THE NEW MADRID RIVERFRONT IMPROVEMENT PROJECT
NEW MADRID, MISSOURI**

**SECTION 00800b
SPECIAL CONTRACT REQUIREMENTS**

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**THE NEW MADRID RIVERFRONT IMPROVEMENT PROJECT
NEW MADRID, MISSOURI**

SECTION 00800b - SPECIAL CONTRACT REQUIREMENTS

1.1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984). The Contractor shall be required to (a) commence work under this contract within 10 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 340 calendar days after the date of receipt by him of notice to proceed. The time stated for completion shall include final cleanup of the premises. (FAR 52.211-10)

1.2. EXCLUSION PERIODS IN COMPUTING COMPLETION SCHEDULES. No work will be required during the period between 1 December and 31 May, inclusive. This period has not been considered in computing the time allowed for completion in accordance with paragraph 1.1 above. The Contractor may, however, perform work during all or any part of the non-work period provided that he has received prior approval therefore, in writing, from the Contracting Officer. In the event that the Contractor's operations are suspended at the beginning of or during this period, the Contracting Officer reserves the right to direct the Contractor to restore the work area to at least the level of flood protection existing prior to the Contractor's operations in the area, in accordance with the procedures of paragraph 1.54, all at no additional cost to the Government.

1.3. LIQUIDATED DAMAGES-CONSTRUCTION (Sept 2000).

(a) If the Contractor fails to complete the work within the time specified in the contract, the Contractor shall pay liquidated damages to the Government in the amount of \$430.00 for each calendar day of delay until the work is completed or accepted.

(b) If the Government terminates the Contractor's right to proceed, liquidated damages will continue to accrue until the work is completed. These liquidated damages are in addition to excess costs of repurchase under the Termination clause."

1.4. EXCEPTION TO LIQUIDATED DAMAGES. The Contractor's obligations specified in paragraph 1.3 are exempt from liquidated damages for Sodding (Section 02922b) and Exterior Planting (Section 02930b) due to the limited specified seasonal planting seasons.

1.5. CONTRACT DRAWINGS AND SPECIFICATIONS (AUG 2000).

a. The Government will provide to the Contractor, without charge, one set of contract drawings and specifications, except publications incorporated into the technical provisions by reference, in electronic or paper media as chosen by the Contracting Officer.

b. The Contractor shall--

(1) Check all drawings immediately;

(2) Compare all drawings and verify the figures before laying out the work;

(3) Promptly notify the Contracting Officer of any discrepancies;

(4) Be responsible for any errors which might have been avoided by complying with this paragraph b; and

(5) Reproduce and print contract drawings and specifications as needed.

c. In general-

(1) Large-scale drawings shall govern small-scale drawings; and

(2) The Contractor shall follow figures marked on drawings in preference to scale measurements.

d. Omissions from the drawings or specifications or the misdescription of details of work that are manifestly necessary to carry out the intent of the drawings and specifications, or that are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work. The Contractor shall perform such details as if fully and correctly set forth and described in the drawings and specifications.

e. The work shall conform to the specifications and the contract drawings identified on the following index of drawings:

THE NEW MADRID FRONT PROJECT
NEW MADRID, MISSOURI

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(DFARS 252.236-7001)

1.6. PHYSICAL DATA (APR 1984). Data and information furnished or referred to below are for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

a. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by aerial photographs and topographic surveys.

b. Weather Conditions. Information with respect to temperatures and precipitation may be obtained from the National Weather Service. Also see paragraph 1.28, "Time Extensions for Unusually Severe Weather".

c. Transportation Facilities.

(1) Roads. Interstate Highway 55, Missouri State Route U, local roads and New Madrid City streets serve the Project area.

(2) Railroads. Canadian National/Illinois Central Railroad serves the general area.

d. Floods. High water stages or events are not to be considered a "flood," and damages resulting therefrom are not compensable under paragraph 1.18 DAMAGE TO WORK unless high water stages or events exceed Elevation 290.00 ft. NGVD within the Government furnished rights-of-way.

e. Additional Data. Additional data consisting of cross sections, river stage records, and records of borings may be available for inspection at the U.S. Army Engineer District, Memphis, Tennessee. (FAR 52.236-4)

1.7 RIGHTS-OF-WAY.

a. The rights-of-way and easements for the work to be constructed under this contract within the limits indicated on the drawings will be provided by the Government without cost to the Contractor. However, the Contractor shall make his own arrangements with the appropriate owners or organizations for transporting his equipment across, over or under railroad tracks, highways, bridges, private property, and utility lines and shall provide at his own expense any additional right-of-way or easements required to effect such crossings,

including insurance requirements of owners. Limits of right-of-way which will be provided by the Government are as indicated on the drawings.

b. The Contractor shall, upon reasonable notice, without expense to the Government and at any time during the progress of the work when not being actively used for contract operations, promptly vacate and clean up any part of the Government grounds that have been allotted to or have been in use by him when directed to do so by the Contracting Officer.

c. The Contractor shall not obstruct any existing roads on the lands controlled by the United States except with the permission of the Contracting Officer, and shall maintain such roads in as good condition as exists at the time of commencement of the work.

d. Any additional right-of-way required for access or for the Contractor's method of operation must be obtained by and at the expense of the Contractor. The Contractor shall submit written evidence to the Contracting Officer that he has obtained the rights-of-way from the property owners. The written evidence shall consist of an authenticated copy of the conveyance under which the Contractor acquired the rights-of-way, prepared and executed in accordance with the laws of the State of Missouri. If temporary rights are obtained by the Contractor, the period of time shall coincide with paragraph 1.1, "Commencement, Prosecution, and Completion of Work", of the SPECIAL CONTRACT REQUIREMENTS, plus a reasonable time for any extension granted for completion of the work. The Contractor shall be solely responsible for any and all damages, claims for damages, and liability of any nature whatsoever arising from or growing out of the use of rights-of-way other than those rights-of-way furnished by the Government.

e. The Contractor shall repair, at his own expense, any and all damage to the existing roads when such damage is a result of his operations on this contract. The Contractor shall also replace, at his own expense, any and all surfacing displaced or damaged by his operations on this contract. The repairs and/or replacement shall be done to the satisfaction of the Contracting Officer.

1.8. LAYOUT OF WORK.

a. The Contractor will re-establish the following baselines and bench marks at the site of the work:

- (1) Baselines as shown on the drawings.
- (2) Bench marks as shown on the drawings.

b. From the baselines and bench marks established by the Government, the Contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.

c. The Contractor shall furnish, at his own expense, such stakes,

templates, platforms, equipment, tools and materials, and all labor as may be required in laying out any part of the work from the baselines and bench marks established by the Government. It shall be the responsibility of the Contractor to maintain and preserve all stakes and marks established by the Contracting Officer until authorized to remove them, and if such marks are destroyed, by the Contractor or through his negligence, prior to their authorized removal, they may be replaced by the Contracting Officer, at his discretion, and the expense of replacement will be deducted from any amounts due or to become due the Contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking of the work.

1.9. NOT USED

1.10. QUANTITY SURVEYS - ALTERNATE I

a. Quantity Survey Method. The cross-section method shall be used to obtain topography. Cross-section spacing will depend upon the terrain but shall not exceed 100 feet. All breaks in slope shall be recorded along the cross-section with a maximum distance 25 feet between observations.

b. Quantity Survey Limits. After clearing of vegetation and trees, the topographic survey shall extend to 50 feet beyond the limits of work or to the Right-of-Way limits as shown on the drawings.

c. Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes and all other records relating to the survey or to the layout of the work to the Contracting Officer, who shall use them as necessary to determine the amount of progress payments. The Contractor shall retain copies of all such material furnished to the Contracting Officer. (FAR 52.236-16)

d. Quantity surveys as used in this clause means a topographical survey accomplished by ground methods requiring the use of a total station instrument with the display output recorded and stored in an electronic field book for further calculations in a computer. The Contractor shall furnish the electronic data in an Intergraph or PacSoft format to the Contracting Officer.

e. Quantity Survey Method. The cross-section method shall be used to obtain topography. Cross-section spacing will depend upon the terrain but shall not exceed 100 feet. All breaks in slope shall be recorded along the cross-section with a maximum distance 25 feet between observations.

f. Quantity Survey Limits. After clearing of vegetation and trees, the topographic survey shall extend to 50 feet beyond the limits of work or to the Right-of-Way limits as shown on the drawings.

1.11. PROGRESS CHART. The schedule of work will be in accordance with the progress chart. The progress chart required by provisions of paragraph (a) of

the CONTRACT CLAUSE entitled "Schedules for Construction Contracts" shall be prepared on ENG Form 2454, copies of which will be furnished to the Contractor by the Government. THREE COPIES OF THE SCHEDULE WILL BE REQUIRED.

1.12. SAFETY-RELATED SPECIAL REQUIREMENTS. ALL WORK UNDER THIS CONTRACT SHALL COMPLY WITH THE LATEST VERSION OF U.S. ARMY CORPS OF ENGINEERS SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, AND OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) STANDARDS IN EFFECT ON THE DATE OF THE SOLICITATION. NO SEPARATE PAYMENT WILL BE MADE FOR COMPLIANCE WITH EM 385-1-1, NOR FOR COMPLIANCE WITH ANY OF THE OTHER SAFETY-RELATED SPECIAL REQUIREMENTS.

a. Accident Investigations and Reporting. Refer to EM 385-1-1, Section 1. Accidents shall be investigated and reports completed by the immediate supervisor of the employee(s) involved and reported to the Contracting Officer or his representative within one working day after the accident occurs.

b. Accident Prevention Program. Refer to the CONTRACT CLAUSE entitled, "Accident Prevention (Alternate I)". Within 21 calendar days after receipt of Notice of Award of the contract, four copies of the Accident Prevention Program shall be submitted to the Contracting Officer for review and approval. The program shall be prepared in the following format:

(1) An executed LMV Form 358R, Administrative Plan (available upon request).

(2) An executed LMV Form 359R, Activity Hazard Analysis (available upon request).

(3) A copy of company policy statement regarding accident prevention.

(4) When marine plant and equipment are in use under a contract, the method of fuel oil transfer shall be submitted on LMV Form 414R, Fuel Oil Transfer, (available upon request). (Refer to 33 CFR 156.)

b. The Contractor shall not commence physical work at the site until the program has been approved by the Contracting Officer, or his authorized representative. At the Contracting Officer's discretion, the Contractor may submit his Activity Hazard Analysis for only the first phase of construction provided that it is accompanied by an outline of the remaining phases of construction. All remaining phases shall be submitted and accepted prior to the beginning of work in each phase. Also refer to Section 1 of EM 385-1-1.

c. Daily Inspections. The Contractor shall perform daily safety inspections and record them on the forms approved by the Contracting Officer. Reports of daily inspections shall be maintained at the jobsite. The reports shall be records of the daily inspections and resulting actions. Each report will include, as a minimum, the following:

(1) Phase(s) of construction underway during the inspection.

(2) Locations or areas inspections were made.

(3) Results of inspection, including nature of deficiencies

observed and corrective actions taken, or to be taken, date, and signature of the person responsible for its contents.

d. Machinery and Mechanized Equipment. Machinery and mechanized equipment used under this contract shall comply with the following:

(1) When mechanized equipment is operated on floating plant, the Contractor shall provide positive and acceptable means of preventing this equipment from moving or falling into the water. The type of equipment addressed by this clause includes front-end loaders, bulldozers, trucks (both on- and off-road), backhoes, track hoes, and similar equipment. If the Contractor plans to use such equipment on floating plant, an activity hazard analysis must be developed for this feature of work. The plan must include a detailed explanation of the type or types of physical barriers, curbs, structures, etc., which will be incorporated to protect the operator and prevent the equipment from entering the water. Nonstructural warning devices may be considered for situations where the use of structural barriers is determined to be impracticable. The activity hazard analysis must thoroughly address the procedure and be submitted to the Corps for review and acceptance prior to start of this feature of work.

(2) The stability of crawler, truck, and wheel-mounted cranes shall be assured.

(a) The manufacturer's load-rating chart may be used to determine the maximum allowable working load for each particular crane's boom angle provided a test load, with a boom angle of 20 degrees, confirms the manufacturer's load-rating table.

(b) Stability tests are required if:

(i) There is no manufacturer's load-rating chart securely fixed to the operator's cab;

(ii) There has been a change in the boom or other structural members; or

(iii) There has been a change in the counterweight.

The test shall consist of lifting a load with the boom in the least stable undercarriage position and at an angle of 20 degrees above the horizontal. The test shall be conducted under close supervision on a firm, level surface. The load that tilts the machine shall be identified as the test load. The test load moment (in ft-lbs) shall then be calculated by multiplying the horizontal distance (in ft) from the center of rotation of the machine to the test load, times the test load (in lbs). Three-fourths of this test-load moment shall then be used to compute the maximum allowable operating loads for the boom at 20, 40, 60, and 80 degrees above horizontal. From these maximum allowable operating loads, a curve shall be plotted and posted in the cab of the machine in sight of the operator. These values shall not be exceeded except in the performance test described below. The test load shall never exceed 110 percent of the manufacturer's maximum rated capacity.

(c) In lieu of the test and computations above, the crane may be load tested for stability at each of the four boom positions listed above.

(3) Performance tests shall be performed in accordance with Section 16 of EM 385-1-1. Performance tests shall be conducted after each stability test, when the crane is placed in service on a project, and at least every 12 months.

(4) Inspections shall be made which will ensure a safe and economical operation of both cranes and draglines. Specific inspections and their frequencies are listed on the appropriate checklists noted below. Results of inspections and tests for cranes shall be recorded on the Safety Inspection Check List, LMV Form 326R (available upon request), and inspection results for draglines shall be recorded on LMV Form 373R (available upon request). Copies of the inspections and tests shall be available at the jobsite for review. All stability and performance tests on cranes and all complete dragline inspections shall be witnessed by the Contracting Officer or his authorized representative.

(5) A complete dragline inspection shall be made:

- (a) At least annually;
- (b) Prior to the dragline being placed in operation; and
- (c) After the dragline has been out of service for more than six months.

e. Safety Sign. The Contractor shall furnish, erect, and maintain a safety sign at the site, as located by the Contracting Officer. The sign shall conform to the requirements of this paragraph and the drawing entitled "Safety Sign", included at the end of these Special Contract Requirements. The lettering shall be black and the background white. When placed on floating plant, the sign may be half size. Upon request, the Government will furnish a decal of the Engineer Castle. The sign shall be erected as soon as practicable, but not later than 15 calendar days after the date established for commencement of work. The data required shall be current.

1.13. BASIS FOR SETTLEMENT OF PROPOSALS (JAN 1997). Actual costs will be used to determine equipment costs for a settlement proposal submitted on the total cost basis under FAR 49.206-2(b). In evaluating a terminations settlement proposal using the total cost basis, the following principles will be applied to determine allowable equipment costs:

(1) Actual costs for each piece of equipment, or groups of similar serial or series equipment, need not be available in the Contractor's accounting records to determine total actual equipment costs.

(2) If equipment costs have been allocated to a contract using predetermined rates, those charges will be adjusted to actual costs.

(3) Recorded job costs adjusted for unallowable expenses will be used to determine equipment operating expenses.

(4) Ownership costs (depreciation) will be determined using the Contractor's depreciation schedule (subject to the provisions of FAR 31.205-11).

(5) License, taxes, storage and insurance costs are normally

recovered as an indirect expense and unless the Contractor charges these costs directly to contracts, they will be recovered through the indirect expense rate. (EFARS 52.249-5000)

1.14. CERTIFICATES OF COMPLIANCE. Any certificates required for demonstrating proof of compliance of material with specification requirements shall be executed in four (4) copies. Each certificate shall be signed by an official authorized to certify on behalf of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the test to which the report applies. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

1.15. CONTRACTOR'S CERTIFICATE. Each submittal of shop drawings and materials data shall be accompanied by a certificate, signed by the head of the Quality Control Organization of the prime Contractor, that the prime Contractor has reviewed in detail all shop drawings and materials contained in the submittal and that they are correct and in strict conformance with the contract drawings and specifications except as may be otherwise explicitly stated. The Government will first check for the Contractor's certificate and then review and render approval action or indicate disapproval in those cases where contract requirements are not fulfilled.

1.16. SHOP DRAWINGS. The Contractor shall submit to the Contracting Officer for approval 6 copies of all shop drawings as called for under the various headings of these specifications. These drawings shall be complete and detailed. If approved by the Contracting Officer, each copy of the drawings will be identified as having received such approval by being so stamped and dated. The Contractor shall make any correction required by the Contracting Officer. If the Contractor considers any correction indicated on the drawings to constitute a change to the contract drawings or specifications, notice as required under the CONTRACT CLAUSE entitled "Changes", will be given to the Contracting Officer. Five sets of all shop drawings will be retained by the Contracting Officer and one set will be returned to the Contractor. The approval of the drawings by the Contracting Officer shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the Contractor of the responsibility for any errors which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

1.17. AS-BUILT DRAWINGS. The Contractor shall maintain two (2) full-size sets of the Contract drawings depicting a current record of the work as actually constructed. One set is for the Contractor's use and one for the Government's use. These working as-built drawing red-line mark-ups may be manually or electronically generated using the construction plans. These working as-built drawings shall be reviewed at least monthly with the Contracting Officer, prior to the Contractor submitting a request for progress payment. Both shall certify that the as-built drawings are accurate and up-to-date before progress payment is made. Upon completion of the work and not later than 60 days from acceptance,

the Contractor shall deliver a complete final set of the as-built red-line marked-up plans depicting the construction as actually accomplished. The final as-built drawings shall be identified as such by marking or stamping them with the words "AS-BUILT DRAWINGS" in letters at least 3/16" high. Those drawings where no change is involved shall be marked or stamped "AS-BUILT, NO CHANGE". Compliance and delivery of the final as-built drawings will be enforced through the approval of final payment. Also, the quality of the final as-built drawings will be reflected in the Contractor's performance evaluation.

1.18. DAMAGE TO WORK. The responsibility for damage to any part of the permanent work shall be as set forth in the CONTRACT CLAUSE entitled "Permits and Responsibilities". However, if, in the judgment of the Contracting Officer, any part of the permanent work performed by the Contractor is damaged by flood, tornado, or earthquake, which damage is not due to the failure of the Contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the Contractor shall make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. Should Local Interest be responsible for some portion of the cost for this work their liability will increase accordingly for corrective action costs. If, in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such work, an equitable adjustment pursuant to the CONTRACT CLAUSE entitled "Changes" will be made as full compensation for the repairs of that part of the permanent work for which there are no applicable contract unit or lump sum prices. Except as herein provided, damage to all work (including temporary construction), utilities, materials, equipment and plant shall be repaired to the satisfaction of the Contracting Officer at the Contractor's expense regardless of the cause of such damage.

1.19. NOTIFICATION OF AREA ENGINEER BEFORE BEGINNING WORK. At least 7 days before beginning work, the Contractor shall notify Mr. Steven P. Shankle, Acting Area Engineer, Caruthersville Area Office, 706 Harry S. Truman Boulevard, Caruthersville, Missouri 63830-1268, Telephone No. 901-544-3074 or 573-333-1043. COLLECT CALLS WILL NOT BE ACCEPTED.

1.20. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (MAR 1995).

a. This clause does not apply to terminations. See SPECIAL CONTRACT REQUIREMENT entitled, "Basis for Settlement of Proposals" and FAR Part 49.

b. Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a Contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the Contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the Contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, Region V. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the Contracting Officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be

developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

c. Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(2)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-lease-back arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

d. When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the Contracting Officer shall request the Contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet. (EFARS 52.231-5000)

NOTE: THE CONTRACTOR MAY PURCHASE THE EQUIPMENT MANUAL FROM THE GOVERNMENT PRINTING OFFICE. THE GOVERNMENT PRINTING OFFICE TELEPHONE NO. IS 202-512-1800.

1.21. RETESTING OF CONSTRUCTION MATERIALS. Unless otherwise specified, where the Technical Specifications state that tests will be performed at the expense of the Government, the cost of only the initial test will be borne by the Government. Any retesting due to failure of the materials to meet the requirements in the initial test or any retesting requested by the Contractor shall be performed at the Contractor's expense. The retests shall be at laboratories approved by the Contracting Officer. The costs of retests made at Government laboratories will be deducted from the total amount due the Contractor.

1.22. VEHICLE WEIGHT LIMITATIONS. Vehicle weight limitations for operation on roads, streets, and bridges may affect the prosecution of work under this contract. The Contractor will be responsible for obtaining all necessary licenses and permits in accordance with the CONTRACT CLAUSE entitled "Permits and Responsibilities".

1.23. OBSTRUCTIONS.

a. Utilities. The exact location, depth, and height of utilities shown on drawings shall be verified in the field by the Contractor. At least 10 days before beginning work in the vicinity of a utility, the Contractor shall call the appropriate "Call Before You Dig" number listed below. The Contractor shall exercise special care when working in the vicinity of utilities to prevent damage thereto or injury to the Contractor's employees or others. Any damage to the utilities or interruptions of service occasioned by the Contractor's operations shall be repaired and the service restored promptly at his expense.

In the event the Contractor elects to have utilities relocated for his own convenience, he shall make his own arrangement with utility owners for the rerouting and replacement to their permanent location after completion of the work adjacent thereto. All costs associated with utility relocation for the Contractor's convenience shall be at his expense.

CALL BEFORE YOU DIG NUMBERS

Missouri 1-800-344-7483 (1-800-DIG-RITE)

d. Mile Posts and Stage Gages. The Contractor shall, when necessary to perform the work under this contract, remove all levee mileposts and stage gages encountered within the work limits. After completion of the work, the Contractor shall reinstall the levee mileposts at their proper location and shall reset the stage gages at their correct elevations. Survey notes and records attesting to the locations and elevations of the mileposts and gages shall be furnished to the Contracting Officer. The Contractor shall be responsible for any damage to mileposts and gages caused through his fault or negligence. No separate payment will be made for the removal and restoration of mileposts and gages, and all cost incurred by this clause shall be considered an incidental expense of the Contractor.

1.24. NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES). In compliance with the General Permit of the NPDES, the Contracting Officer will file a Notice of Intent (NOI) with the State of Missouri. In addition, the Stormwater Pollution Prevention Plan (SWPPP) required by the General Permit has been prepared and is included at the end of these Special Contract Requirements. The Contractor shall adhere strictly to the erosion control provisions of SWPPP and Section 01130b - ENVIRONMENTAL PROTECTION to minimize sediment discharge into nearby water courses to the maximum extent practicable. Furthermore, the Contractor and all subcontractors shall sign the certification contained in the SWPPP. The Contractor shall maintain the SWPPP on the construction site at all times. The SWPPP shall take precedence over the technical specifications.

1.25. PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984). The Contractor shall perform on the site, and with its own organization, work equivalent to at least fifteen (15) percent of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government. (FAR 52.236-1)

1.26. CONTINUING CONTRACT

a. This is a continuing contract, as authorized by Section 10 of the River and Harbor Act of September 22, 1922 (33 U.S. Code 621). The payment of some portion of the contract price is dependent upon reservations of funds from future appropriations, and from future contribution to the project having one or more non-federal project sponsors. The responsibilities of the Government are limited by this clause notwithstanding any contrary provision of the "Payments Under Fixed-Price Construction Contracts" clause or any other clause of this contract.

b. The sum of \$1,000.00 has been reserved for this contract and is available for payments to the Contractor during the current fiscal year. It is expected that Congress will make appropriations for future fiscal years from which additional funds together with funds provided by one or more non-federal project sponsors will be reserved for this contract.

c. Failure to make payments in excess of the amount currently

reserved, or that may be reserved from time to time, shall not entitle the Contractor to a price adjustment under the terms of this contract except as specifically provided in paragraphs "f" and "i" below. No such failure shall constitute a breach of this contract, except that this provision shall not bar a breach-of-contract action if an amount finally determined to be due as a termination allowance remains unpaid for one year due solely to a failure to reserve sufficient additional funds therefore.

d. The Government may at any time reserve additional funds for payments under the contract if there are funds available for such purpose. The Contracting Officer will promptly notify the Contractor of any additional funds reserved for the contract by issuing an administrative modification to the contract.

e. If earnings will be such that funds reserved for the contract will be exhausted before the end of any fiscal year, the Contractor shall give written notice to the Contracting Officer of the estimated date of exhaustion and the amount of additional funds which will be needed to meet payments due or to become due under the contract during that fiscal year. This notice shall be given not less than 45 or more than 60 days prior to the estimated date of exhaustion.

f. No payments will be made after exhaustion of funds except to the extent that additional funds are reserved for the contract. The Contractor shall be entitled to simple interest on any payment that the Contracting Officer determines was actually earned under the terms of the contract and would have been made except for exhaustion of funds. Interest shall be computed from the time such payment would otherwise have been made until actually or constructively made, and shall be at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97, as in effect on the first day of the delay in such payment.

g. Any suspension, delay, or interruption of work arising from exhaustion or anticipated exhaustion of funds shall not constitute a breach of this contract and shall not entitle the Contractor to any price adjustment under the "Suspension of Work" clause or in any other manner under this contract.

h. An equitable adjustment in performance time shall be made for any increase in the time required for performance of any part of the work arising from exhaustion of funds or the reasonable anticipation of exhaustion of funds.

i. If, upon the expiration of sixty (60) days after the beginning of the fiscal year following an exhaustion of funds, the Government has failed to reserve sufficient additional funds to cover payments otherwise due, the Contractor, by written notice delivered to the Contracting Officer at any time before such additional funds are reserved, may elect to treat his right to proceed with the work as having been terminated. Such a termination shall be considered a termination for the convenience of the Government.

j. If at any time it becomes apparent that the funds reserved for any fiscal year are in excess of the funds required to meet all payments due or to become due the Contractor because of work performed and to be performed under the contract during the fiscal year, the Government reserves the right, after notice to the Contractor, to reduce said reservation by the amount of such

excess. (EFARS 52.232-5001)

1.27. NOT USED

1.28. TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (31 OCT 1989).

a. This provision specifies the procedure for determination of time extensions for unusually severe weather in accordance with the CONTRACT CLAUSE entitled "Default (Fixed-Price Construction)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

(1) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

(2) The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the Contractor.

b. The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The Contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON 5 DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
12	10	8	7	6	5	4	3	4	4	7	11

c. Upon acknowledgment of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor will record on the daily CQC report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50 percent or more of the Contractor's scheduled work day. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph b, above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the CONTRACT CLAUSE entitled "Default (Fixed-Price Construction)". (ER 415-1-15, Appendix A)

1.29. PAYMENT FOR MOBILIZATION AND DEMOBILIZATION (DEC 1991).

a. The Government will pay all costs for the mobilization and demobilization of all of the Contractor's plant and equipment at the contract lump sum price for this item.

(1) Sixty (60) percent of the lump sum price upon completion of

the Contractor's mobilization at the work site.

(2) The remaining forty (40) percent upon completion of demobilization.

b. The Contracting Officer may require the Contractor to furnish cost data to justify this portion of the bid if the Contracting Officer believes that the percentages in paragraphs a(1) and (2) of this clause do not bear a reasonable relation to the cost of the work in this contract.

(1) Failure to justify such price to the satisfaction of the Contracting Officer will result in payment, as determined by the Contracting Officer, of--

(i) Actual mobilization costs at completion of mobilization;

(ii) Actual demobilization costs at completion of demobilization; and

(iii) The remainder of this item in the final payment under this contract.

(2) The Contracting Officer's determination of the actual costs in paragraph b(1) of this clause is not subject to appeal. (DFARS 252.236-7004)

1.30. STONE SOURCES.

a. Stone meeting the requirements of these specifications has been produced from the sources listed below:

<u>Name of Firm</u>	<u>Name of Quarry</u>	<u>Location</u>	<u>Certification</u>
<u>Date</u>			
Brickeys Stone, LLC	Old Menefee	Bloomsdale, MO	1997
Martin Marietta Aggregates	Three Rivers	Smithland, KY	1996
Meridian Aggregate Co.	Valley Stone	Black Rock, AR	1995
Pine Bluff Sand and Gravel Co.	River Mountain	Delaware, AR	1996
Seminole Stone	Seminole	Dexter, MO	1996
Tower Rock Stone Co.	Bussen	Ste. Genevieve, MO	1995
Tower Rock Stone Co.	Gray's Point	Scott City, MO	1995
Vulcan Materials Co.	Gilbertsville	Lake City, KY	1996
Vulcan Materials Co.	Parsons	Parsons, TN	1996
Vulcan Materials Co.	Verkler	Black Rock, AR	1996
Southern Ready Mix	Pride	Tuscumbia, AL	1999

b. Stone may be furnished either from any of the listed sources or from any other sources designated by the Contractor and accepted by the Contracting Officer, subject to the conditions hereinafter stated.

c. After the award of the contract, the Contractor shall designate in writing only one source or one combination of sources from which he proposes to furnish stone. If the Contractor proposes to furnish stone from a source or sources not listed above, he may designate only a single source for stone.

Samples for acceptance testing shall be provided as required in the Technical Specifications. If a source for stone so designated by the Contractor is not accepted by the Contracting Officer for use, the Contractor may not propose other sources but shall furnish the stone from a listed source at no additional cost to the Government.

d. Acceptance of a source of stone shall not be construed as acceptance of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels, when such materials are unsuitable for stone as determined by the Contracting Officer. Materials produced from a listed source shall meet all the requirements of the Technical Specifications.

1.31. FIELD OFFICE BUILDING.

a. The Contractor shall furnish and maintain a temporary building for the exclusive use of the Government inspectors during the life of the contract. The building shall conform to the following requirements:

Floor Space	Not less than 300 sq. ft.
Height of Ceiling	Not less than 7 feet
Windows	Not less than 4
Doors	At least 1
Type of Floor	Wood or Concrete

The building shall be of light but weatherproof construction. Windows shall be arranged to open and to be fastened from the inside. All door and window openings shall be provided with suitable screens. The door shall be equipped with a durable hasp and padlock. Interior surfaces of exterior walls and ceilings shall be covered with insulating board and an inside storage room of adequate size shall be provided. The Contractor shall furnish an adequate supply of approved drinking water, sufficient electrical outlets for office calculators and equipment, running water for a toilet facility having a flushable toilet and a sink, all electricity required and sufficient fixtures for adequate lighting, and during cold weather shall furnish adequate heat. The field office, its location and all facilities shall be subject to the approval of the Contracting Officer. The building shall also be equipped with air conditioning during hot weather. The office shall be equipped with at least 8 chairs, 2 desks, 1 drawing table, 2 two-drawer filing cabinets, and 1 conference table. The contractor shall thoroughly clean the office at least weekly.

b. No separate payment will be made for furnishing and maintaining the field office. Such building will remain the property of the Contractor and shall be removed upon completion of the work as provided in the CONTRACT CLAUSE entitled "Operations and Storage Areas".

1.32. SUBMITTALS. See Section 01330b.

1.33. NOT USED

1.34. TEMPORARY PROJECT FENCING. Temporary project fencing as required by Paragraph 04.A.04 of EM 385-1-1 is required on this project.

1.35. MAINTENANCE OF TRAFFIC. The Contractor shall maintain traffic over

existing roads and bridges in the vicinity of the New Madrid Front Project until the Project is completed and accepted by the Contracting Officer. The Contractor shall erect and maintain such signs and barricades as the Contracting Officer deems appropriate for protection of the traveling public. The levee road will be closed during construction.

1.36. NOT USED

1.37. NOT USED

1.38. SUNDAY, HOLIDAY AND NIGHT WORK. Sunday and Holiday work will be at the option of the Contractor, but night work will not be permitted unless otherwise authorized by the Contracting Officer.

1.39. NOT USED

1.40. NOT USED

1.41. STORAGE OF EQUIPMENT AND MATERIALS. Storage of the Contractor's equipment and materials shall be at those areas within the rights-of-way designated by the Contracting Officer.

1.42. WARRANTY OF CONSTRUCTION (MAR 1994).

a. In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph i. of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

e. The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

h. In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

i. Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

j. This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud. (FAR 52.246-21)

1.43. UTILITY SERVICES.

a. The Contractor shall provide at the site for all work under this contract, the necessary utility services needed for completion of work under this contract.

b. Electricity. All electric current required by the Contractor shall be furnished at his own expense. All temporary connections for electricity shall be subject to the approval of the Contracting Officer. All temporary lines shall be furnished, installed, connected and maintained by the Contractor in a workman-like manner satisfactory to the Contracting Officer, and shall be removed by the Contractor in like manner at his expense prior to completion of the construction.

1.44. NOT USED.

1.45. NOT USED

1.46. NOT USED.

1.47. NOT USED

1.48. NOT USED

1.49. NOT USED

1.50. NOT USED.

1.51. PATENTS, PROPRIETARY RIGHTS.

a. The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.

b. In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed hereunder, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.

1.52. PROTECTION OF MATERIALS AND WORK. The Contractor shall at all times protect and preserve all materials, supplies, and equipment of every description (including property which may be Government-furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to enclose or specially protect such property shall be complied with. If, as determined by the Contracting Officer, material, equipment, supplies, and work performed are not adequately protected by the Contractor, such property may be protected by the Government and the cost thereof may be charged to the Contractor or deducted from any payments due to him.

1.53. EXISTING FLOOD PROTECTION. The Contractor shall conduct the construction of all work under this contract in such manner that existing flood protection within the limits of the existing embankments is maintained at all times. The embankments shall not be disturbed except as necessary to perform the work. When the work under this contract is completed, flood protection within such areas shall be at least equal to that existing before start of construction.

1.54. NOT USED.

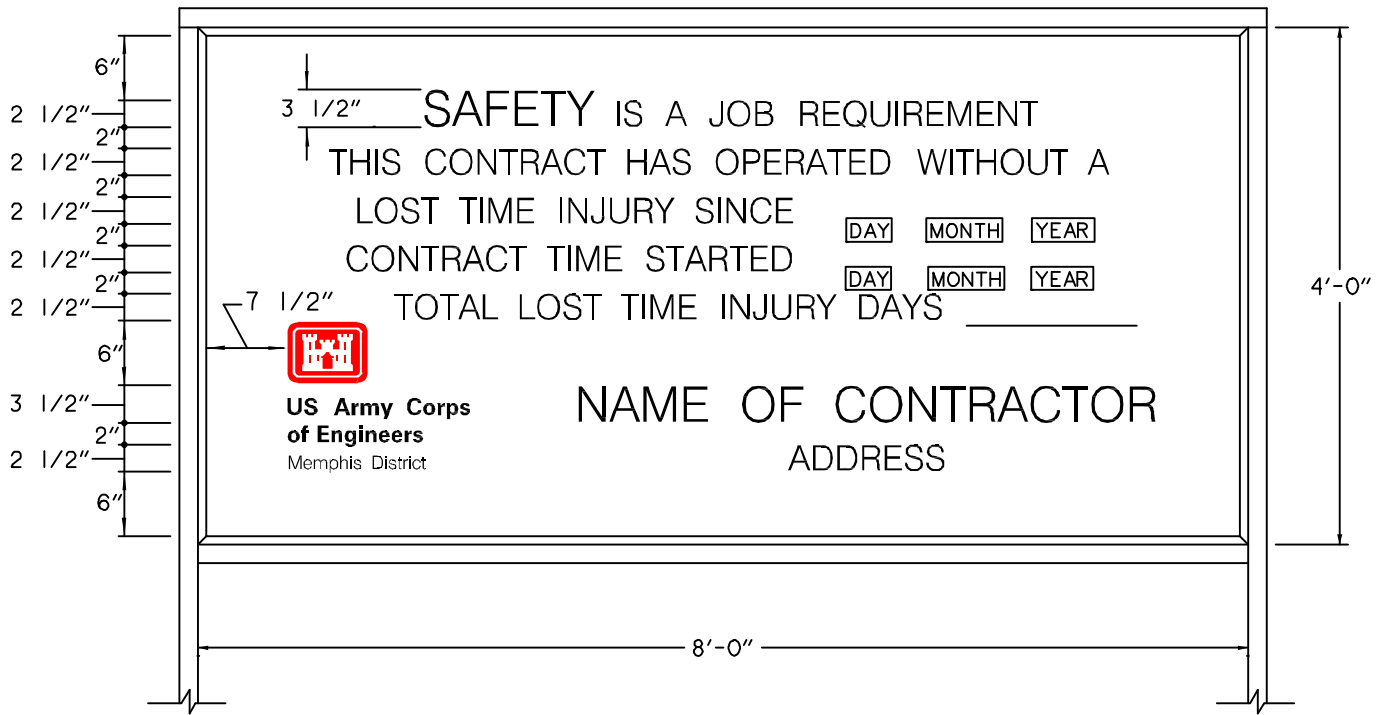
1.55. NOT USED

1.56. NOT USED.

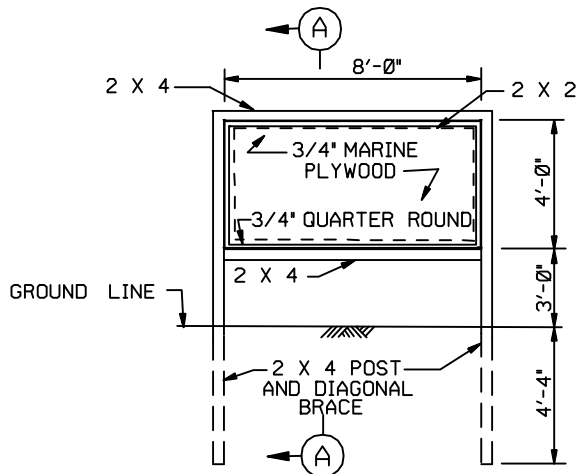
1.57. NOT USED.

1.58. NOT USED.

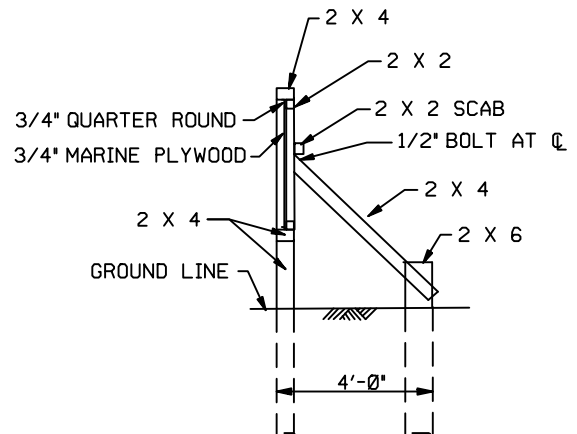
1.59. DESIGNATED BILLING OFFICE. The designated billing office for this contract shall be Caruthersville Area Office, 706 Harry S. Truman Blvd, Caruthersville, Missouri 63830-1268.



ELEVATION



ELEVATION



SECTION A-A

NOTES:

1. CONTRACTOR SHALL CONSTRUCT AND MAINTAIN A DURABLE SIGN AS SHOWN.
2. WOOD IN CONTACT WITH GROUND SHALL BE TREATED LUMBER.
3. ALL EXPOSED SURFACES SHALL BE WHITE HOUSE PAINT.
4. LETTERING SHALL BE BLACK.
5. ENGINEER CASTLE DECAL FURNISHED BY GOVERNMENT.
6. 22 GA. SHEET METAL MAY BE USED IN LIEU OF PLYWOOD.



**US Army Corps
of Engineers**

Memphis District

ENGINEER CASTLE DETAIL

SCALE: NONE

MARCH 1995

U.S. ARMY ENGINEER DISTRICT, MEMPHIS
CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

SAFETY SIGN

**MISSISSIPPI RIVER FRONT PROJECT
CITY OF NEW MADRID
NEW MADRID COUNTY, MISSOURI
STORM WATER POLLUTION PREVENTION PLAN
FOR STORM WATER GENERAL PERMIT
U.S. ARMY CORPS OF ENGINEERS, MEMPHIS DISTRICT**

1. LOCATION AND NATURE OF ACTIVITY

This project consists of building a boat ramp, two parking lots, a levee walkway, restroom and two terraces. The levee will be cleaned, riprap restored to 3:1 slopes and existing riprap above elevation 285.0 covered with topsoil, geotechnical fabric and solid sodded.

A set of construction drawings showing the project location and the details of the construction will be located on the site at all times. The construction begins approximately 125 feet before New Madrid Capital Boulevard intersects the Mississippi River Levee and ends approximately 125 feet after New Madrid Main Street intersects the Mississippi River Levee.

2. AREA AFFECTED

The total area of the site, within the right-of-way limits, which will be impacted by construction, is approximately 30 acres.

3. CONTROL OF POLLUTANTS DURING CONSTRUCTION

3.1 NON-STRUCTURAL MEASURES

3.1.1 General

Prior to the beginning of any construction, the Contracting Officer will identify all land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms outside the construction limits without special permission. The Contractor shall provide effective protection for land, water and vegetation resources at all times. The Contractor shall construct or install temporary and/or permanent erosion and sedimentation control features as indicated herein to minimize pollutants entering the Mississippi River, other water bodies or wetlands.

3.1.2 Protection of Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the contract drawings or as directed by the Contracting Officer to be preserved shall be clearly identified by marking, fencing, wrapping with boards, or other approved techniques.

3.1.3 Reduction of Exposure of Unprotected Erodible Soils

All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Vegetative ground cover shall not be destroyed, removed or disturbed more than 20 calendar days prior to grading or earth moving. Clearing shall progress in reasonably sized increments as needed to use the areas developed. To the extent feasible, material embankments, side slopes, back slopes, berms and any other exposed surfaces shall be stabilized by temporary seeding, mulching, fabric mats or other approved stabilization methods, as soon as possible after material placement, or within 14 days on areas that will remain unfinished more than 21 calendar days. Should construction be halted, for any reason, temporarily or permanently, for more than 21 days, in any portion of the site, temporary or permanent turfing measures, or other approved temporary stabilization of exposed areas, such as mulching, shall be accomplished within 14 days after construction is halted.

3.2 STRUCTURAL MEASURES

3.2.1 General

Temporary erosion and sediment control measures such as silt fences, check dams, and sedimentation basins shall be constructed and maintained until permanent drainage and erosion control facilities are complete and operative. Placement of perimeter controls shall commence with initiation of construction and shall remain in effect during the remainder of construction until final stabilization of those portions of the site upward of the perimeter control. Temporary erosion controls shall be maintained until final stabilization of exposed areas, after which they shall be removed. All structural devices shall be

constructed in accordance with Temporary Erosion Control Devices Standard Drawing.

3.2.2 Silt Fences

If used, silt fences shall be constructed along the levee toe and any location where stormwater may enter the stream or wetland, along inlet ditches, and any other areas necessary to minimize the entry of excavated material into the Mississippi River.

3.2.3 Check Dams

Check dams shall be constructed across inlet ditches, drains and swales using baled straw or equivalent devices to minimize sediment entry into the stream. Check dams shall be inspected for sediment accumulation after each significant rainfall and sediment removed when it reaches one-half the height of the barrier. Sediment removal shall include removal and disposition in a location where it will not erode into construction areas, water courses or wetlands.

3.2.4 Sediment Basins

Sediment from construction areas with 10 or more disturbed acres at one time shall be trapped in temporary or permanent sediment basins. After each storm, the basins shall be allowed to settle for 24 to 48 hours after which the basins shall be pumped dry. In order to maintain basin effectiveness, accumulated sediment shall be removed when the depth of sediment reaches one-third of the depth of structure in any part of the pool. Overflow shall be controlled by paved weir, by vertical overflow pipe draining from the surface, or by a spillway protected by baled straw filter barriers in the spillway and at the outlet toe of the spillway. The collected top soil sediment shall be reused for fill on the construction site, and/or conserved for use at another site(s). If used, the basins shall provide at least 3,600 cubic feet of storage for each acre drained. Where such basins are not used, other equivalent sediment control measures are required.

3.2.5 Other Measures

Other temporary erosion and sediment control measures such as berms, dikes, swales and drains, may be used with, or in lieu of, the above mentioned measures provided they are consistent with Best Management Practices (BMPs). They shall be maintained

until permanent drainage and erosion control facilities are complete and operative. Earthen erosion control features shall be compacted and stabilized immediately with vegetation as specified in paragraphs 4.1.3 and 4.1.4.

3.2.6 Velocity Dissipation Devices

Should drains or swales be used, they shall be constructed with velocity dissipation devices (check dams) to reduce the need for more stringent erosion control practices in the swale or drain. These devices shall be removed after the erosive areas have been stabilized.

4. CONTROL OF POLLUTANTS AFTER CONSTRUCTION

4.1 ESTABLISHMENT OF TURF

4.1.1 General

Turf shall be established as a permanent erosion control measure along the clearing and excavation reaches and any other areas which are disturbed during construction. All material embankments, all berm areas, and any other disturbed areas shall be turfed. Turf shall be established in accordance with the Contract Specifications.

4.1.2 Fertilizer

Fertilizer shall be distributed uniformly over the areas to be seeded at a rate which will supply not less than 40 pounds of available nitrogen, 40 pounds of available phosphorous, and 40 pounds of potash per acre.

4.1.3 Seeding

Seed sown for permanent turfing shall be as specified in the technical specifications. Temporary seeding shall consist of grasses appropriate for the season when they are sown. A satisfactory method of sowing shall be employed, using approved mechanical power-drawn seeders, mechanical hand-seeders, broadcast-seeders, or other approved methods. When conditions are such by reason of drought, high winds, excessive moisture, or other factors that satisfactory results are not likely to be obtained, work shall be halted as directed and resumed only when

conditions are favorable or when approved alternative or corrective measures and procedures have been effected. If inspection either during seeding operations or after there is a show of green indicates that areas have been left unplanted, additional seed shall be sown.

4.1.4 Mulching

If used, mulch shall be materials that do not contain noxious grass or weed seed that might be detrimental to the turfing being established or to adjacent farmland. Mulch shall be spread uniformly in a continuous blanket, using 2 tons per acre of straw mulch or 1,200 pounds per acre of wood cellulose fiber mulch.

4.2 STATE AND LOCAL CONTROLS

There are no known State or local erosion and sediment control requirements applicable to this work other than those met by the requirements of this permit.

5. RUNOFF COEFFICIENT, IMPERVIOUS AREAS, SOILS

The runoff coefficient immediately after construction is estimated to range between 0.10 and 0.30. Once the material embankment and other disturbed areas have been re-vegetated, the runoff coefficient should return to pre-construction conditions with no increase in impervious areas.

Soils in the area consist of fat and lean clays with some sand and silty sands.

6. RECEIVING WATER

The receiving stream of The New Madrid Front Project is the Mississippi River.

7. OTHER CONSIDERATIONS

7.1 Construction is not within 1,000 feet of waters classified in 10 CSR 20-7.013, Water Quality Standards, as:

- a. Public drinking water supply lakes
- b. Outstanding National Resource Waters
- c. Outstanding State Resource Waters
- d. Streams designated for cold water sport fishery
- e. A lake in EPA's Clean Lakes Program

7.2 Construction is not within 100 feet of waters classified as major reservoirs.

8. DEFINITIONS

8.1 Best Management Practices (BMPs) Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operation procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

8.2 Commencement of Construction The initial disturbance of soils associated with clearing, grading, or excavating activities or other construction activities.

8.3 Drainage Swale A drainage way with a lining of grass, riprap, asphalt, concrete, or other material installed to convey runoff without causing erosion.

8.4 Check Dam Small temporary dams constructed across a swale or drainage ditch to reduce the velocity of runoff flows.

8.5 Final Stabilization All soil disturbing activities at the site have been completed, and a uniform perennial vegetative cover with a density of 85% of the cover for the area has been established or equivalent stabilization measures (such as the use of mulches or geo-textiles) have been employed.

9. CERTIFICATION

"I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification."

Jack V. Scherer , Colonel, Corps of Engineers 901-544-3221
Name & Official Title Phone No.

Signature Date Signed

Name & Official Title of Contractor Phone No.

Signature Date Signed

Name & Official Title of Subcontractor Phone No.

Signature Date Signed

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01090b

SOURCES FOR REFERENCE PUBLICATIONS

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1.2	ORDERING INFORMATION
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PART 3	EXECUTION (Not Applicable)

SECTION 01090b

SOURCES FOR REFERENCE PUBLICATIONS

PART 1 GENERAL

1.1 REFERENCES

Various publications are referenced in other sections of the specifications to establish requirements for the work. These references are identified in each section by document number, date and title. The document number used in the citation is the number assigned by the sponsoring organization, e.g. UL 1 (1993; Rev thru Jan 1995) Flexible Metal Conduit. However, when the sponsoring organization has not assigned a number to a document, an identifying number has been assigned for convenience, e.g. UL's unnumbered 1995 edition of their Building Materials Directory is identified as UL-01 (1995) Building Materials Directory. The sponsoring organization number (UL 1) can be distinguished from an assigned identifying number (UL-01) by the lack of a dash mark (-) in the sponsoring organization assigned number.

1.2 ORDERING INFORMATION

The addresses of the organizations whose publications are referenced in other sections of these specifications are listed below, and if the source of the publications is different from the address of the sponsoring organization, that information is also provided. Documents listed in the specifications with numbers that were not assigned by the sponsoring organization should be ordered from the source by title rather than by number.

ACI INTERNATIONAL (ACI)
P.O. Box 9094
Farmington Hills, MI 48333-9094
Ph: 248-848-3800
Fax: 248-848-3801
Internet: <http://www.aci-int.org>

AGRICULTURAL MARKETING SERVICE (AMS)
Seed Regulatory and Testing Branch
USDA, AMS, LS Div.
Room 209, Bldg. 306, BARC-East
Beltsville, MD 20705-2325
Ph: 301-504-9430
Fax: 301-504-5454 Internet: <http://www.ams.usda.gov/lsg/ls-sd.htm>
e-mail: james_p_triplett@usda.gov

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)
444 N. Capital St., NW, Suite 249
Washington, DC 20001
Ph: 800-231-3475
Fax: 800-525-5562
Internet: www.aashto.org

NOTE: AASHTO documents with numbers beginning with M or T are available only in Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 1998 @\$289.00\X

AMERICAN HARDBOARD ASSOCIATION (AHA)
1210 W. Northwest Highway
Palatine, IL 60067
Ph: 847-934-8800
Fax: 847-934-8803

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
11 West 42nd St
New York, NY 10036
Ph: 212-642-4900
Fax: 212-398-0023
Internet: www.ansi.org/

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959
Ph: 610-832-9500
Fax: 610-832-9555
Internet: www.astm.org
NOTE: The annual ASTM Book of Standards (66 Vol) is available for \$3500.00. Prices of individual standards vary.

AMERICAN WATER WORKS ASSOCIATION(AWWA)
6666 West Quincy
Denver, CO 80235
Ph: 800-926-7337
Fax: 303-795-1989
Internet: www.awwa.org

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)
933 No. Plum Grove Rd.
Schaumburg, IL 60173-4758
Ph: 847-517-1200
Fax: 847-517-1206
Internet: <http://www.crsi.org>

CORPS OF ENGINEERS (COE)
Order from:
U.S. Army Engineer Waterways Experiment Station
ATTN: Technical Report Distribution Section, Services
Branch, TIC
3909 Halls Ferry Rd.
Vicksburg, MS 39180-6199
Ph: 601-634-2571
Fax: 601-634-2506

NOTE: COE Handbook for Concrete and Cement (Documents w/prefix CRD-C) (1949-present; 2 Vol) free to Government offices; \$10.00 plus \$8.00 per yr for 4 qtrly supplements to others). Individual documents, single copies free. Order from address above.
FAX: 703-321-8547

ENGINEERING MANUALS (EM)
USACE Publications Depot
Attn: CEIM-SP-D
2803 52nd Avenue
Hyattsville, MD 20781-1102
Ph: 301-394-0081

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)
SUPERINTENDENT OF DOCUMENTS
U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON, DC 20402
Ph: 202-512-1800
Fax: 202-512-2250

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)
900 Spring St.
Silver Spring, MD 20910
Ph: 301-587-1400
Fax: 301-585-4219

U.S. DEPARTMENT OF COMMERCE (DOC)
14th Street and Constitutional Avenue, NW
Washington, DC 20230
Ph: 202-482-2112

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01130b

ENVIRONMENTAL PROTECTION

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SECTION 01130b

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 DEFINITIONS

For the purpose of this specification, environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of air, water, and land, and includes management of visual aesthetics, noise, solid waste, radiant energy and radioactive materials, as well as other pollutants.

1.2 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection. Plan for and provide environmental protective measures to control pollution that develops during normal construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Comply with Federal, State, and local regulations pertaining to the environment, including but not limited to water, air, and noise pollution.

1.2.1 Environmental Protection Plan

Within 21 days after receipt of Notice of Award of the contract, the Contractor shall submit in writing an Environmental Protection Plan and, prior to starting work, and meet with representatives of the Contracting Officer to develop mutual understanding relative to compliance with this provision and administration of the environmental protection program. Approval of the Contractor's plan will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants and other environmental protection measures. The Government reserves the right to make changes in his environmental protection plan and operations as necessary to maintain satisfactory environmental protection performance. The Environmental Protection Plan shall include but not be limited to the following:

1.2.1.1 Protection of Features

The Contractor shall determine methods for the protection of features to be preserved within authorized work areas. The Contractor shall prepare a listing of methods to protect resources needing protection, i.e., trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archaeological and cultural resources.

1.2.1.2 Procedures

The Contractor shall implement procedures to provide the required environmental protection and to comply with the applicable laws and regulations. The Contractor shall set out the procedures to be followed to correct pollution of the environment due to accident, natural causes or failure to follow the procedures set out in accordance with the Environmental Protection Plan.

1.2.1.3 Permit or License

The Corps will obtain all needed permits or licenses.

1.2.1.4 Drawings

The Contractor shall include drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, stockpiles of earth materials, and disposal areas for excess earth material and unsatisfactory earth materials.

1.2.1.5 Environmental Monitoring Plans

The Contractor shall include environmental monitoring plans for the job site which incorporate land, water, air and noise monitoring.

1.2.1.6 Traffic Control Plan

The Contractor shall include a traffic control plan for the job site.

1.2.1.7 Surface and Ground Water

The Contractor shall establish methods of protecting surface and ground water during construction activities.

1.2.1.8 Work Area Plan

The Contractor shall include a work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. The plan shall include measures for marking the limits of use areas.

1.2.1.9 Plan of Borrow Area(s)

The Contractor shall include a plan of borrow area(s) for the job site.

1.3 SUBCONTRACTORS

Assurance of compliance with this section by subcontractors will be the responsibility of the Contractor.

1.4 PERMITS OBTAINED BY CORPS OF ENGINEERS

The Corps of Engineers will not obtain any permits for this project. See Contract Clause entitled "PERMITS AND RESPONSIBILITIES".

1.5 REGULATORY REQUIREMENTS

The Contractor shall comply with all state regulatory and statutory

requirements.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the contract drawings or specifications. Environmental protection shall be as stated in the following subparagraphs.

3.1.1 Protection of Land Resources

Prior to the beginning of any construction, the Contracting Officer will identify

all land resources to be preserved within the Contractor's work area. The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without special permission from the Contracting Officer. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs.

3.1.1.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas where no work is to be performed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence and during all construction operations. Where construction operations are to be conducted during darkness, the markers shall be visible during darkness. The Contractor shall convey to his personnel the purpose of marking and/or protection of all necessary objects.

3.1.1.2 Protection of Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features to be preserved, indicated and defined on the drawings submitted by the Contractor as a part of the Environmental Protection Plan, shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

3.1.1.3 Reduction of Exposure of Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in instances where the constructed feature obscures borrow areas, quarries and waste material areas, these areas shall not initially be cleared in total. Clearing of such areas shall progress in reasonably sized increments as needed to use the areas developed as approved by the Contracting Officer.

3.1.1.4 Temporary Protection of Disturbed Areas

Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation, including but not limited to the following:

a. Retardation and Control of Runoff

Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses, and the Contractor shall also utilize any measures required by area-wide plans approved under Paragraph 208 of the Clean Water Act.

3.1.1.5 Erosion and Sedimentation Control Devices

The Contractor shall construct or install all temporary and permanent erosion sedimentation control features. Temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basin, grassing and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.

3.1.1.6 Location of Contractor Facilities

The Contractor's field offices, staging areas, stockpiles, storage, and temporary buildings shall be placed in areas designated on the contract drawings and approved by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only on approval by the Contracting Officer.

3.1.1.7 Borrow Areas on Government Property

Borrow areas on Government property shall be managed to minimize erosion and to prevent sediment from entering nearby water courses or lakes.

3.1.1.8 Disposal Areas on Government Property

Disposal areas on Government property shall be managed and controlled to limit material to areas designated on the contract drawings and prevent erosion of soil or sediment from entering nearby water courses or lakes. Disposal areas shall be developed in accordance with the grading plan indicated on the contract drawings.

3.1.1.9 Temporary Excavation and Embankments

Temporary excavation and embankments shall be controlled to protect adjacent areas from contamination.

3.1.1.10 Disposal of Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination. The Contractor shall transport all solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal.

3.1.1.11 Disposal of Chemical Wastes

Chemical wastes shall be stored in corrosion resistant containers, removed from the work area and disposed of in accordance with Federal, State, and local regulations.

3.1.1.12 Disposal of Discarded Materials

Discarded materials other than those which can be included in the solid waste category shall be handled as directed by the Contracting Officer.

3.2 HISTORICAL, ARCHAEOLOGICAL AND CULTURAL RESOURCES

Existing historical, archaeological and cultural resources within the Contractor's work area will be so designated by the Contracting Officer and precautions shall be taken by the Contractor to preserve all such resources as they existed at the time they were pointed out to the Contractor. The Contractor shall install all protection for these resources so designated on the contract drawings and shall be responsible for their preservation during this contract. If during construction items of apparent archaeological or historical interest are discovered, they shall be left undisturbed and the Contractor shall report the find immediately to the Contracting Officer.

3.3 PROTECTION OF WATER RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to avoid pollution of surface and ground waters. Special management techniques as set out below shall be implemented to control water pollution by the listed construction activities which are included in this contract.

3.3.1 Diversion Operations

The Contractor shall plan his operations and perform all work necessary to minimize adverse impact or violation of the water quality standard. Construction operations for dewatering shall be controlled at all times to limit impact of water turbidity on the habitat for wildlife and impacts on water quality for downstream use.

3.3.2 Stream Crossings

Stream crossings shall be controlled during construction. Crossings shall provide movement of materials or equipment which do not violate water pollution control standards of the Federal, State or local government.

3.3.3 Monitoring of Water Areas Affected by Construction Activities

Monitoring of water areas affected by construction activities shall be the responsibility of the Contractor. All water areas affected by construction activities shall be monitored by the Contractor.

3.4 PROTECTION OF FISH AND WILDLIFE RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to minimize interference with, disturbance to and damage of fish and wildlife. Species that require specific attention along with measures for their protection shall be listed by the Contractor prior to

beginning of construction operations.

3.5 PROTECTION OF AIR RESOURCES

The Contractor shall keep construction activities under surveillance, management and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with the laws of the state or states in which the work is being done and all Federal emission and performance laws and standards. Special management techniques as set out below shall be implemented to control air pollution by the construction activities which are included in the contract.

3.5.1 Particulates

Dust particles, aerosols, gaseous by-products from all construction activities, processing and preparation of materials, such as from asphaltic batch plants, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, excess excavated material areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards mentioned in the paragraph "PROTECTION OF AIR RESOURCES" to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated at such intervals as to keep the disturbed area damp at all times. The Contractor must have sufficient competent equipment available to accomplish this task. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

3.5.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times

3.5.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

3.5.4 Monitoring Air Quality

Monitoring of air quality shall be the responsibility of the Contractor. All air areas affected by the construction activities shall be monitored by the Contractor.

3.6 INSPECTION

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with the Contractor's environmental protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action as may be approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until

satisfactory corrective action has been taken. No time extensions will be granted or costs or damages allowed to the Contractor for any such suspension.

3.7 POST CONSTRUCTION CLEANUP

The Contractor shall clean up all area(s) used for construction.

3.8 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with the plans submitted for approval by the Contracting Officer.

3.9 MAINTENANCE OF POLLUTION FACILITIES

The Contractor shall maintain all constructed facilities and temporary pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

3.10 TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL

The Contractor shall train his personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities (vegetative covers and instruments required for monitoring purposes) to insure adequate and continuous environmental pollution control.

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01270b

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- 1.3.13 Sodding
- 1.3.14 Cast-in-Place Structural Concrete
- 1.3.15 Curb and Gutter
- 1.3.16 Stone Veneer (On Existing Retaining Wall)
- 1.3.17 Handrail / Levee Walkway
- 1.3.18 Handrail / Stairs
- 1.3.19 Handrail / Boat Ramp

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

SECTION 01270b

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 615/A 615M	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 127	(1988; R 1993) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1993) Specific Gravity and Absorption of Fine Aggregate
ASTM D 1250	(1980; R 1990) Petroleum Measurement Tables

1.2 LUMP SUM PAYMENT ITEMS

Payment items for the work of this contract for which contract lump sum payments will be made are listed in the BIDDING SCHEDULE and described below. All costs for items of work, which are not specifically mentioned to be included in a particular lump sum or unit price payment item, shall be included in the listed lump sum item most closely associated with the work involved. The lump sum price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for which separate payment is not otherwise provided.

1.2.1 Mobilization and Demobilization

1.2.1.1 Payment

Payment will be made for costs associated with mobilization and demobilization, as defined in Special Contract Requirement PAYMENT FOR MOBILIZATION AND DEMOBILIZATION.

1.2.1.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.2 Environmental Protection

1.2.2.1 Payment

Payment will be made for all costs associated with performing all operations necessary to prevent and/or control pollution that would develop during construction and otherwise providing protection of the environment during construction.

1.2.2.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.3 Clearing and Grubbing

1.2.3.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for Clearing and Grubbing the Site. Clearing will also include dressing the existing riprap areas below elevation 285.0 to eliminate any abrupt changes.

1.2.3.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.4 Demolition

1.2.4.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for demolition of specified items on the work site.

1.2.4.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.5 Debris Clean-Up

1.2.5.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for levee embankment debris clean-up, as specified.

1.2.5.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.6 Pavement Markings

1.2.6.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for providing and installing all Pavement Markings.

1.2.6.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.7 Site Furnishings

1.2.7.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for furnishing the site with trash receptacles and bike racks specified in the plans.

1.2.7.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.8 Exterior Planting

1.2.8.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for landscaping the site with plants as specified in the plans.

1.2.8.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.9 River Access

1.2.9.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for construction of the river access. Materials include footing, steps, segmental concrete wall units, reinforced concrete seat, geotextile and cheekwalls handrail.

1.2.9.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.10 Sign (New Madrid)

1.2.10.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for providing and installing the "New Madrid" sign with foundation. Electrical work and lighting of sign are included in Item 0031 Electrical Work.

1.2.10.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.11 Signs (Traffic)

1.2.11.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for providing and installing all new and/or temporary signs for traffic control.

1.2.11.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.12 Street Lights

1.2.12.1 Payment

Payment will be made for costs associated with furnishing labor, materials and equipment, and performing all operations necessary for providing and installing all Street Lights.

1.2.12.2 Unit of Measure

Unit of measure, lump sum: LS.

1.2.13 Electrical Work

1.2.13.1 Payment

Payment will be made for costs associated with furnishing and installing all electrical wiring and associated equipment. The city of New Madrid will provide drops as indicated on the electrical contract drawings.

1.2.13.2 Unit of Measure

Unit of measure, lump sum: LS.

1.3 UNIT PRICE PAYMENT ITEMS

Payment items for the work of this contract on which the contract unit price payments will be made are listed in the BIDDING SCHEDULE and described below. The unit price and payment made for each item listed shall constitute full compensation for furnishing all plant, labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, tests and reports, and for performing all work required for each of the unit price items.

1.3.1 Riprap "R90"

1.3.1.1 Payment

Payment will be made for costs associated with furnishing, transporting, stockpiling (if applicable) and placing the riprap "R90" protection as specified.

1.3.1.2 Measurement

Riprap "R90" will be measured for payment by the ton (2,000 pounds). Weight tickets are to be furnished for each load and weight is to be made by a weighing facility acceptable to the Contracting Officer.

1.3.1.3 Unit of Measurement

Unit of measurement, ton: TN.

1.3.2 Riprap "R200"

1.3.2.1 Payment

Payment will be made for costs associated with furnishing, transporting, stockpiling (if applicable) and placing the riprap "R200" protection as specified.

1.3.2.2 Measurement

Riprap "R200" will be measured for payment by the ton (2,000 pounds). Weight tickets are to be furnished for each load and weight is to be made by a weighing facility acceptable to the Contracting Officer.

1.3.2.3 Unit of Measurement

Unit of measurement, ton: TN.

1.3.3 Excavation

1.3.3.1 Payment

Payment for excavation will be made at the contract unit price per cubic yard for "Excavation", which price and payment shall constitute full compensation for all necessary excavation as specified herein.

1.3.3.2 Measurement

Measurement for excavation will be made within the limits and between the theoretical lines and grade for such work as indicated on the drawings.

1.3.3.3 Unit of Measure

Unit of measure, cubic yard: CY.

1.3.4 Impervious Backfill

1.3.4.1 Payment

Payment for impervious backfill will be made at the contract unit price per cubic yard for "Impervious Backfill", which price and payment shall constitute full compensation for constructing the backfill as specified herein.

1.3.4.2 Measurement

Measurement for impervious backfill will be made within the limits and between the theoretical lines and grade for such work as indicated on the drawings and/or as modified by the Contracting Officer.

1.3.4.3 Unit of Measure

Unit of measure, cubic yard: CY.

1.3.5 Topsoil

1.3.5.1 Payment

Payment for topsoil will be made at the contract unit price per cubic yard for "Topsoil", which price and payment shall constitute full compensation for constructing the topsoil as specified herein.

1.3.5.2 Measurement

Measurement for topsoil will be made within the limits and between the theoretical lines and grade for such work as indicated on the drawings and/or as modified by the Contracting Officer.

1.3.5.3 Unit of Measure

Unit of measure, cubic yard: CY.

1.3.6 Erosion Control Blanket

1.3.6.1 Payment

Payment will be made for the costs associated with furnishing and placing the erosion control blanket as specified. No payment will be made for fine grading, trenching, or other miscellaneous materials necessary for placement of the erosion control blanket.

1.3.6.2 Measurement

Erosion control blanket will be measured for payment by the square yard.

1.3.6.3 Unit of Measure

Unit of Measure, square yard: SY.

1.3.7 Geotextile

1.3.7.1 Payment

Payment will be made for the costs associated with furnishing and placing the geotextile as specified.

1.3.7.2 Measurement

Geotextile will be measured for payment by the square yard. Square yards measured will be the actual surface area with no adjustment for the overlapping material within seams or overlaps or turned down areas. Geotextile for fill treatment over existing riprap under flumes and boat ramp is paid for under this item.

1.3.7.3 Unit of Measure

Unit of Measure, square yard: SY.

1.3.8 Asphaltic Concrete Pavements

1.3.8.1 Payment

Payment will be made at the contract unit price per ton for "Asphaltic Concrete Pavements", which price includes the cost of all labor, materials and the use of equipment and tools required to complete the asphaltic concrete paving work.

1.3.8.2 Measurement

Asphaltic Concrete Pavements will be measured for payment by the ton (2,000 pounds). Weight tickets are to be furnished for each load and weight is to be made by a weighing facility acceptable to the Contracting Officer.

1.3.8.3 Unit of Measure

Unit of measure, ton: TN.

1.3.9 Aggregate Base Course

1.3.9.1 Payment

Payment for aggregate base course will be made at the contract unit price per cubic yard for "Aggregate Base Course", which price and payment shall constitute full compensation for constructing the aggregate base course as specified herein.

1.3.9.2 Measurement

Measurement for aggregate base course will be made within the limits and between the theoretical lines and grade for such work as indicated on the drawings and/or as modified by the Contracting Officer.

1.3.9.3 Unit of Measure

Unit of measure, cubic yard: CY.

1.3.10 Concrete Paving

1.3.10.1 Payment

Payment will be made at the contract price per square yard for parking lots and boat ramp. Payment will constitute full compensation for furnishing all materials, equipment, plant and tools, and for all labor and other incidentals necessary to complete the concrete pavement. No separate payment will be made for toewalls, any cementitious materials, admixtures, steel reinforcement, dowels or tie bars, or for any joint materials.

1.3.10.2 Measurement

Concrete will be measured in place in the completed and accepted pavement only within the neat line dimensions shown in the contract drawings.

1.3.10.3 Unit of Measure

Unit of measure, square yards: SY.

1.3.11 Walkway with Brick Pavers

1.3.11.1 Payment

Payment will be made for costs associated with furnishing, transporting, stockpiling, placing, and constructing the walkway with brick pavers, concrete edging and aggregate base course as specified.

1.3.11.2 Measurement

Walkway with Brick Pavers will be measured for payment by the square yard.

1.3.11.3 Unit of Measure

Unit of Measure, square yard: SY.

1.3.12 Segmental Concrete Block Retaining Wall

1.3.12.1 Payment

Payment will be made for costs associated with furnishing, transporting, stockpiling, placing, and constructing the segmental concrete block retaining wall, geotextile fabric, aggregate base course and geotextile wrapped PVC underdrain as specified.

1.3.12.2 Measurement

Segmental Concrete Block Retaining Wall will be measured for payment by the square foot. Area measured is from top of footing to concrete edging.

1.3.12.3 Unit of Measure

Unit of Measure, square foot: SF.

1.3.13 Sodding

1.3.13.1 Payment

Payment will be made for the costs associated with furnishing and placing the sod as specified.

1.3.13.2 Measurement

Sodding will be measured for payment by the square yard.

1.3.13.3 Unit of Measure

Unit of Measure, square yards: SY.

1.3.14 Cast-in-Place Structural Concrete

1.3.14.1 Payment

Payment will be made at the contract unit price per cubic yard for "Cast-in-Place Structural Concrete", which price includes the cost of all labor, materials, reinforcement, and the use of equipment and tools required to complete the concrete work. Items paid under this section include new dead man, flumes, sidewalks, steps at boat ramp, boat ramp and precast section of boat ramp.

1.3.14.2 Measurement

Measurement of cast-in-place structural concrete for payment will be made on the basis of the actual volume within the neat lines of the structure as indicated on the contract drawings. No deductions will be made for rounded or beveled edges, for spacer occupied by metal work, for conduits, for voids or for embedded items which are less than 5 cubic feet in volume or 1 square foot in cross section.

1.3.14.3 Unit of Measure

Unit of measure, cubic yard: CY.

1.3.15 Curb and Gutter

1.3.15.1 Payment

Payment will be made at the contract unit price per linear foot for "Curb and Gutter", which price includes the cost of all labor, materials, reinforcement, and the use of equipment and tools required to complete the curb and gutter work.

1.3.15.2 Measurement

Measurement of curb and gutter for payment will be made on the basis of the actual linear feet constructed.

1.3.15.3 Unit of Measure

Unit of measure, linear feet: LF.

1.3.16 Stone Veneer (On Existing Retaining Wall)

1.3.16.1 Payment

Payment for stone veneer will be made at the contract unit price per square foot for "Stone Veneer", which price and payment shall constitute full compensation for furnishing, transporting, stockpiling and placing the stone veneer on the existing retaining wall as specified.

1.3.16.2 Measurement

Stone Veneer will be measured for payment by the square foot.

1.3.16.3 Unit of Measure

Unit of measure, square foot: SF.

1.3.17 Handrail / Levee Walkway

1.3.17.1 Payment

Payment will be made for the costs associated with furnishing and placing the handrail/levee walkway as specified and shown on the drawings.

1.3.17.2 Measurement

Handrail will be measured for payment by the actual linear feet placed as specified or shown.

1.3.17.3 Unit of Measurement

Unit of measurement, linear feet: LF.

1.3.18 Handrail / Stairs

1.3.18.1 Payment

Payment will be made for the costs associated with furnishing and placing the handrail/stairs as specified.

1.3.18.2 Measurement

Handrail will be measured for payment by the actual linear feet placed as specified or shown.

1.3.18.3 Unit of Measurement

Unit of measurement, linear feet: LF.

1.3.19 Handrail / Boat Ramp

1.3.19.1 Payment

Payment will be made for the costs associated with furnishing and placing the handrail/boat ramp as specified.

1.3.19.2 Measurement

Handrail will be measured for payment by the actual linear feet placed as specified or shown.

1.3.19.3 Unit of Measurement

Unit of measurement, linear feet: LF.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01330b

SUBMITTAL PROCEDURES

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SECTION 01330b

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers as follows:

SD-01 Data

SD-04 Drawings

SD-06 Instructions

SD-07 Schedules

SD-08 Statements

SD-09 Reports

SD-13 Certificates

SD-14 Samples

SD-18 Records

SD-19 Operation and Maintenance Manuals

1.2 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.2.1 Government Approved

Governmental approval is required for extensions of design, critical materials, deviations, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," they are considered to be "shop drawings."

1.2.2 Information Only

All submittals not requiring Government approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above.

1.3 APPROVED SUBMITTALS

The Contracting Officer's approval of submittals shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory.

Approval will not relieve the Contractor of the responsibility for any error which may exist, as the Contractor under the Contractor Quality Control (CQC) requirements of this contract is responsible for dimensions, the design of adequate connections and details, and the satisfactory construction of all work. After submittals have been approved by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

1.4 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the Contracting Officer and promptly furnish a corrected submittal in the form and Number of copies specified for the initial submittal. If the Contractor Considers any correction indicated on the submittals to constitute a Change to the contract, a notice in accordance with the Contract Clause "Changes" shall be given promptly to the Contracting Officer.

1.5 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list); certifications; warranties; and other such required submittals. Submittals requiring Government approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

3.2 SUBMITTAL REGISTER (ENG FORM 4288)

At the end of this section is one set of ENG Form 4288 listing items of equipment and materials for which submittals are required by the specifications; this list may not be all inclusive and additional submittals may be required. The Contractor will also be given the submittal register as a diskette containing the computerized ENG Form 4288 and instructions on

the use of the diskette. Columns "d" through "r" have been completed by the Government; the Contractor shall complete columns "a" and "s" through "u" and submit the forms (hard copy plus associated electronic file) to the Contracting Officer for approval within 10 calendar days after Notice to Proceed. The Contractor shall keep this diskette up-to-date and shall submit it to the Government together with the monthly payment request. The approved submittal register will become the scheduling document and will be used to control submittals throughout the life of the contract. The submittal register and the progress schedules shall be coordinated.

3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 30 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval. No delay damages or time extensions will be allowed for time lost in late submittals

3.4 TRANSMITTAL FORM ENG FORM 4025

The sample transmittal form (ENG Form 4025) attached to this section shall be used for submitting both Government approved and information only submittals in accordance with the instructions on the reverse side of the form. These forms will be furnished to the Contractor. This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

3.5.1 Procedures

Submittals shall be prepared ,as specified, with four(4) copies and the Original delivered to the Contracting Officer.

3.5.2 Deviations

For submittals which include proposed deviations requested by the Contractor, the column "variation" of ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. Deviating submittals shall allow 60 calendar days exclusive of mailing time for review and approval. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

3.6 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3.7 GOVERNMENT APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. Three copies of the submittal will be retained by the Contracting Officer and One copy of the submittal will be returned to the Contractor.

3.8 INFORMATION ONLY SUBMITTALS

Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

3.9 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

--End of Section--

CONTRACTOR
(Firm Name)
_____ Approved
_____ Approved with corrections as noted on submittal data and/or attached sheets(s).
SIGNATURE: _____
TITLE: _____
DATE: _____

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.
2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.
3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.
4. Submittals requiring expeditious handling will be submitted on a separate form.
5. Separate transmittal form will be used for submittals under separate sections of the specifications.
6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".
7. Form is self-transmittal, letter of transmittal is not required.
8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.
9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A	--	Approved as submitted.	E	--	Disapproved (See attached).
B	--	Approved, except as noted on drawings.	F	--	Receipt acknowledged.
C	--	Approved, except as noted on drawings. Refer to attached sheet resubmission required.	FX	--	Receipt acknowledged, does not comply as noted with contract requirements.
D	--	Will be returned by separate correspondence.	G	--	Other (<i>Specify</i>)

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

(Reverse of ENG Form 4025-R)

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

SUBMITTAL REGISTER (ER 415-1-10)																	CONTRACT NO.								
TITLE AND LOCATION MISSISSIPPI RIVER FRONT PROJECT - CITY OF NEW MADRID NEW MADRID, MISSOURI										CONTRACTOR							SPECIFICATION SECTION 02922b								
ACTIVITY NO.	TRANS-MITTAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSI-FICATION		CONTRACTOR SCHEDULE DATES	CONTRACTOR		ACTION		GOVERNMENT ACTION		REMARKS	
					D A T A	D R A W I N G S	I N S T R U C T I O N S	S C H E D U L E S	S T A T E M E N T S	R E P O R T S	C E R T I F I C A T E S	S A M P L E S	R E C O R D S	I N F O R M A T I O N O N L Y	G O V A R E P R E S E N T A T I O N S	R E V I E W E R		S U B M I T	A P P R O V A L N E E D E D B Y	M A T E R I A L N E E D E D B Y	C O D E	D A T E	S U B M I T T O G O V E R N M E N T		C O D E
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
			1.2	Chemical Treatment Material	X									X											
			1.2	Topsoil	X									X											
			1.2	Application of Pesticide																					
			1.2	Delivered Topsoil								X		X											
			1.2	Soil Amendments								X		X											
			1.2	Temporary Seeding							X				X										
			1.2	Equipment Calibration						X				X											
			1.2	Soil Test						X				X											
			1.2	Sod							X			X											
			1.2	Topsoil							X			X											
			1.2	pH Aduster							X			X											
			1.2	Fertilizer							X			X											
			1.2	Organic Material							X			X											
			1.2	Soil Conditioner							X			X											
			1.2	Pesticide							X			X											

SUBMITTAL REGISTER (ER 415-1-10)																	CONTRACT NO.								
TITLE AND LOCATION					MISSISSIPPI RIVER FRONT PROJECT - CITY OF NEW MADRID NEW MADRID, MISSOURI										CONTRACTOR				SPECIFICATION SECTION 02930b						
ACTIVITY NO.	TRANS-MITTAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION	CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION		GOVERNMENT ACTION		REMARKS		
					DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	REFORMAT ONLY		GOVERNMENT REVIEWER	APPROVAL NEEDED BY	MATERIAL NEEDED BY	DATE	SUBMIT TO GOVERNMENT	DATE				
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
			1.2	Shop Drawings		X									X										
			1.2	Geotextile	X										X										
			1.2	Chemical Treatment Material	X										X										
			1.2	Application of Pesticide	X										X										
			1.2	Delivered Topsoil									X		X										
			1.2	Soil Amendments									X		X										
			1.2	Mulch									X		X										
			1.2	Geotextile									X		X										
			1.2	Soil Test						X					X										
			1.2	Percolation Test						X					X										
			1.2	Plant Material							X				X										
			1.2	Topsoil							X				X										
			1.2	pH Adjuster							X				X										
			1.2	Fertilizer							X				X										
			1.2	Organic Material							X				X										
			1.2	Soil Conditioner							X														
			1.2	Organic Mulch							X														
			1.2	Mycorrhizal Fungi Inoculum							X				X										
			1.2	Pesticide							X				X										
			1.2	Maintenance Instructions					X						X										

[illegible]

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[illegible]

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01356b

STORM WATER POLLUTION PREVENTION MEASURES

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SECTION 01356b

STORM WATER POLLUTION PREVENTION MEASURES

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3786	(1987) Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method
ASTM D 4439	(1995) Standard Terminology for Geotextiles
ASTM D 4491	(1992) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1995) Determining Apparent Opening Size of a Geotextile
ASTM D 4873	(1995) Identification, Storage, and Handling of Geotextiles

1.2 GENERAL

The Contractor shall implement the storm water pollution prevention measures specified in this section in a manner which will meet the requirements of Section 01130b ENVIRONMENTAL PROTECTION, and the requirements of the National Pollution Discharge Elimination System (NPDES) permit attached to that Section.

1.3 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-13 Certificates

Mill Certificate or Affidavit; FIO.

1.4 EROSION AND SEDIMENT CONTROLS

The controls and measures required by the Contractor are described below.

1.4.1 Stabilization Practices

The stabilization practices to be implemented shall include temporary seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, erosion control matts, protection of trees, preservation of mature vegetation, etc. On his daily CQC Report, the Contractor shall record the dates when the major grading activities occur, (e.g., clearing and grubbing, excavation, embankment, and grading); when construction activities temporarily or permanently cease on a portion of the site; and when stabilization practices are initiated. Except as provided in paragraphs UNSUITABLE CONDITIONS and NO ACTIVITY FOR LESS THAN 21 DAYS, stabilization practices shall be initiated as soon as practicable, but no more than 14 days, in any portion of the site where construction activities have temporarily or permanently ceased.

1.4.1.1 Unsuitable Conditions

Where the initiation of stabilization measures by the fourteenth day after construction activity temporarily or permanently ceases is precluded by unsuitable conditions caused by the weather, stabilization practices shall be initiated as soon as practicable after conditions become suitable.

1.4.1.2 No Activity for Less Than 21 Days

Where construction activity will resume on a portion of the site within 21 days from when activities ceased (e.g., the total time period that construction activity is temporarily ceased is less than 21 days), then stabilization practices do not have to be initiated on that portion of the site by the fourteenth day after construction activity temporarily ceased.

1.4.2 Structural Practices

Structural practices shall be implemented to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Structural practices shall be implemented in a timely manner during the construction process to minimize erosion and sediment runoff. Structural practices shall include the following devices:

1.4.2.1 Silt Fences

The Contractor shall provide silt fences as a temporary structural practice to minimize erosion and sediment runoff. Silt fences shall be properly installed to effectively retain sediment immediately after completing each phase of work where erosion would occur in the form of sheet and rill erosion (e.g. clearing and grubbing, excavation, embankment, and grading). Final removal of silt fence barriers shall be upon approval by the Contracting Officer.

1.4.2.2 Straw Bales

The Contractor shall provide bales of straw as a temporary structural practice to minimize erosion and sediment runoff. Bales shall be properly placed to effectively retain sediment immediately after completing each phase of work (e.g., clearing and grubbing, excavation, embankment, and grading) in each independent runoff area (e.g., after clearing and grubbing in a area between a ridge and drain, bales shall be placed as work progresses, bales shall be removed/replaced/relocated as needed for work to progress in the drainage area). Final removal of straw bale barriers shall be upon approval by the Contracting Officer. Rows of bales of straw shall be provided as follows:

- a. Along the downhill perimeter edge of all areas disturbed.
- b. Along the top of the slope or top bank of drainage ditches, channels, swales, etc. that traverse disturbed areas.
- c. Along the toe of all cut slopes and fill slopes of the construction areas.
- d. Perpendicular to the flow in the bottom of existing drainage ditches, channels, swales, etc. that traverse disturbed areas or carry runoff from disturbed areas. Rows shall be spaced a maximum of 200 feet apart.
- e. Perpendicular to the flow in the bottom of new drainage ditches, channels, and swales. Rows shall be spaced a maximum of 200 feet apart.
- f. At the entrance to culverts that receive runoff from disturbed areas.

PART 2 PRODUCTS

2.1 COMPONENTS FOR SILT FENCES

2.1.1 Filter Fabric

The geotextile shall comply with the requirements of ASTM D 4439, and shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. The filament shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of ester, propylene, or amide, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistance to deterioration due to ultraviolet and heat exposure. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 to 120 degrees F. The filter fabric shall meet the following requirements:

FILTER FABRIC FOR SILT SCREEN FENCE

PHYSICAL PROPERTY	TEST PROCEDURE	STRENGTH REQUIREMENT
Grab Tensile	ASTM D 4632	100 lbs. min.

Elongation (%)		30 % max.
Trapezoid Tear	ASTM D 4533	55 lbs. min.
Mullen Burst	ASTM D 3786	270 lbs. min.
Permittivity	ASTM D 4491	0.2 sec-1
AOS (U.S. Std Sieve)	ASTM D 4751	20-100

2.1.2 Silt Fence Stakes and Posts

The Contractor may use either wooden stakes or steel posts for fence construction. Wooden stakes utilized for silt fence construction, shall have a minimum cross section of 2 inches by 2 inches when oak is used and 4 inches by 4 inches when pine is used, and shall have a minimum length of 5 feet. Steel posts (standard "U" or "T" section) utilized for silt fence construction, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 5 feet.

2.1.3 Mill Certificate or Affidavit

A mill certificate or affidavit shall be provided attesting that the fabric and factory seams meet chemical, physical, and manufacturing requirements specified above. The mill certificate or affidavit shall specify the actual Minimum Average Roll Values and shall identify the fabric supplied by roll identification numbers. The Contractor shall submit a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the filter fabric.

2.1.4 Identification Storage and Handling

Filter fabric shall be identified, stored and handled in accordance with ASTM D 4873.

2.2 COMPONENTS FOR STRAW BALES

The straw in the bales shall be stalks from oats, wheat, rye, barley, or rice, furnished in air dry condition. The bales shall have a standard cross section of 14 inches by 18 inches. All bales shall be either wire-bound or string-tied. The Contractor may use either wooden stakes or steel posts to secure the straw bales to the ground. Wooden stakes utilized for this purpose, shall have a minimum dimensions of 2 inches x 2 inches in cross section and shall have a minimum length of 3 feet. Steel posts (standard "U" or "T" section) utilized for securing straw bales, shall have a minimum weight of 1.33 pounds per linear foot and a minimum length of 3 feet.

3 EXECUTION

3.1 INSTALLATION OF SILT FENCES

Silt fences shall extend a minimum of 16 inches above the ground surface and shall not exceed 34 inches above the ground surface. Filter fabric shall be from in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are unavoidable, filter fabric shall be spliced together at a support post, with a minimum 6 inch overlap, and securely sealed. A trench shall be excavated approximately 4 inches wide and 4

inches deep on the upslope side of the location of the silt fence. The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric. Silt fences shall be removed upon approval by the Contracting Officer.

3.2 INSTALLATION OF STRAW BALES

Straw bales shall be placed in a single row, lengthwise on the contour, with ends of adjacent bales tightly abutting one another. Straw bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a bale and the length of the proposed barrier to a minimum depth of 4 inches. After the bales are staked and chinked (gaps filled by wedging with straw), the excavated soil shall be backfilled against the barrier. Backfill soil shall conform to the ground level on the downhill side and shall be built up to 4 inches against the uphill side of the barrier. Loose straw shall be scattered over the area immediately uphill from a straw bale barrier to increase barrier efficiency. Each bale shall be securely anchored by at least two stakes driven through the bale. The first stake or steel post in each bale shall be driven toward the previously laid bale to force the bales together. Stakes or steel pickets shall be driven a minimum 18 inches deep into the ground to securely anchor the bales.

3.3 MAINTENANCE

The Contractor shall maintain the temporary and permanent vegetation, erosion and sediment control measures, and other protective measures in good and effective operating condition by performing routine inspections to determine condition and effectiveness, by restoration of destroyed vegetative cover, and by repair of erosion and sediment control measures and other protective measures. The following procedures shall be followed to maintain the protective measures.

3.3.1 Silt Fence Maintenance

Silt fences shall be inspected in accordance with paragraph INSPECTIONS. Any required repairs shall be made promptly. Close attention shall be paid to the repair of damaged silt fence resulting from end runs and undercutting. Should the fabric on a silt fence decompose or become ineffective, and the barrier is still necessary, the fabric shall be replaced promptly. Sediment deposits shall be removed when deposits reach one-third of the height of the barrier. When a silt fence is no longer required, it shall be removed. The immediate area occupied by the fence and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be sodded in accordance with Section 02922b SODDING, except that the coverage requirements in paragraph Satisfactory Stand of Grass Plants do not apply.

3.3.2 Straw Bale Maintenance

Straw bale barriers shall be inspected in accordance with paragraph INSPECTIONS. Close attention shall be paid to the repair of damaged bales, end runs and undercutting beneath bales. Necessary repairs to barriers or replacement of bales shall be accomplished promptly. Sediment deposits shall be removed when deposits reach one-half of the height of the barrier.

Bale rows used to retain sediment shall be turned uphill at each end of each row. When a straw bale barrier is no longer required, it shall be removed. The immediate area occupied by the bales and any sediment deposits shall be shaped to an acceptable grade. The areas disturbed by this shaping shall be sodded in accordance with Section 02922b SODDING.

3.4 INSPECTIONS

3.4.1 General

The Contractor shall inspect disturbed areas of the construction site, areas used for storage of materials that are exposed to precipitation that have not been finally stabilized, stabilization practices, structural practices, other controls, and area where vehicles exit the site at least once every seven (7) calendar days and within 24 hours of the end of any storm that produces 0.5 inches or more rainfall at the site. Where sites have been finally stabilized, such inspection shall be conducted at least once every month.

3.4.2 Inspections Details

Disturbed areas and areas used for material storage that are exposed to precipitation shall be inspected for evidence of, or the potential for, pollutants entering the drainage system. Erosion and sediment control measures identified in the Storm Water Pollution Prevention Plan shall be observed to ensure that they are operating correctly. Discharge locations or points shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters. Locations where vehicles exit the site shall be inspected for evidence of offsite sediment tracking.

3.4.3 Inspection Reports

For each inspection conducted, the Contractor shall prepare a report summarizing the scope of the inspection, name(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the Storm Water Pollution Prevention Plan, maintenance performed, and actions taken. The report shall be furnished to the Contracting Officer within 24 hours of the inspection as a part of the Contractor's daily CQC REPORT. A copy of the inspection report shall be maintained on the job site.

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01450b

PROJECT SIGNS, BARRICADES, AND TRAFFIC CONTROL SIGNS

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SECTION 01450b

PROJECT SIGNS, BARRICADES, AND TRAFFIC CONTROL SIGNS

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing, erecting, maintaining, and removing project signs, barricades, and traffic control signs.

1.2 PROJECT SIGNS

The Contractor shall furnish, erect, and maintain two single faced project signs at the location designated by the Contracting Officer. The signs shall be constructed of 3/4-inch marine grade plywood, 3/4-inch A-C exterior plywood, or 22 gage metal, mounted on a substantial framework of 2-inch material. Size, lettering, color and paint shall conform to the details shown on the drawing "Temporary Project Sign" included at the end of this section. In lieu of two signs, the Contractor may double-face a single sign at the specified location, provided such a sign and its erection and supports are approved by the Contracting Officer. Upon request, the Government will furnish without cost to the Contractor four decals of the Engineer Castle. The sign shall be erected as soon as practicable, but not later than 15 calendar days after the date established for commencement of work. The sign shall be removed upon completion of all other construction work under the contract and will become the property of the Contractor.

1.3 BARRICADES AND TRAFFIC CONTROL SIGNS

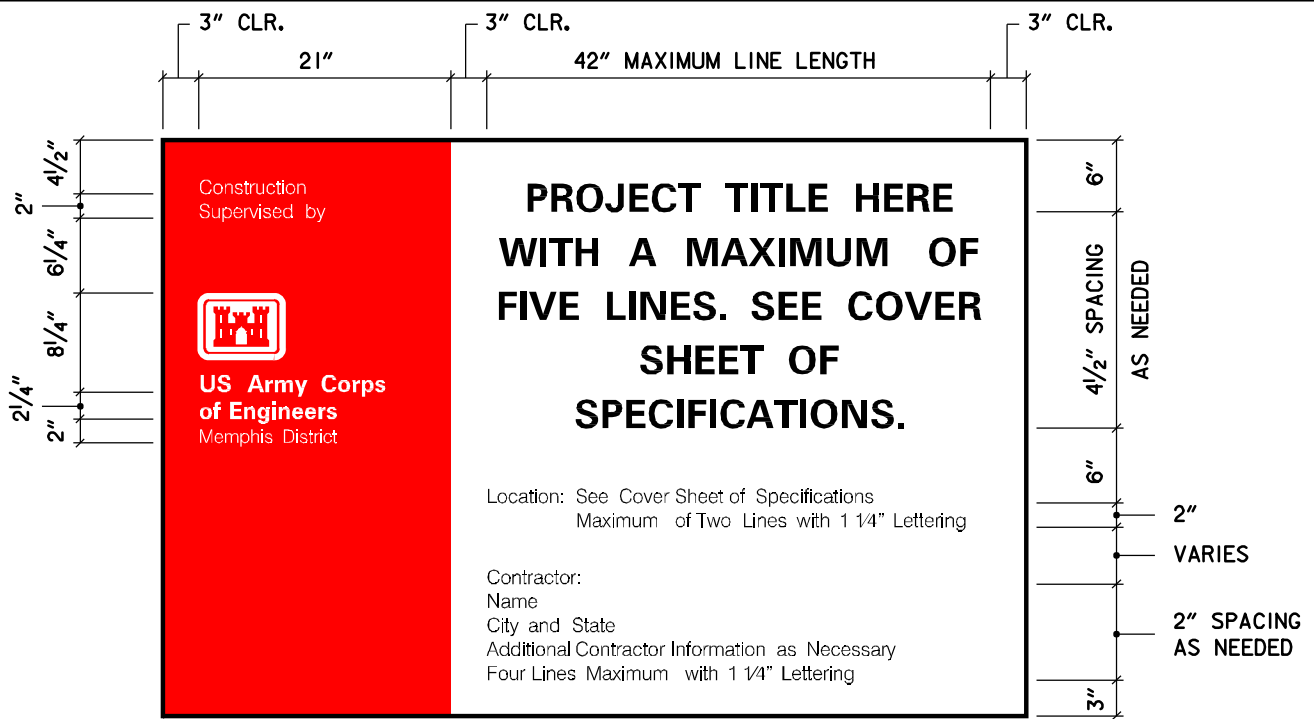
Traffic signs shall be coordinated with the City of New Madrid, Missouri. Barricades and traffic control signs shall be those as recommended by the Contracting Officer and shall conform to the "Manual on Uniform Traffic Control Devices for Streets and Highways," Current Edition.

1.4 PAYMENT

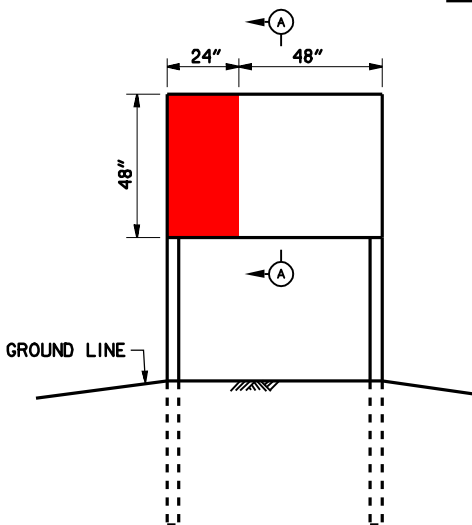
No separate payment will be made for erecting, maintaining and removing projects signs, barricades, and traffic control signs, and all costs in connection therewith will be considered an incidental obligation of the Contractor.

PART 2 PRODUCTS (Not Applicable)

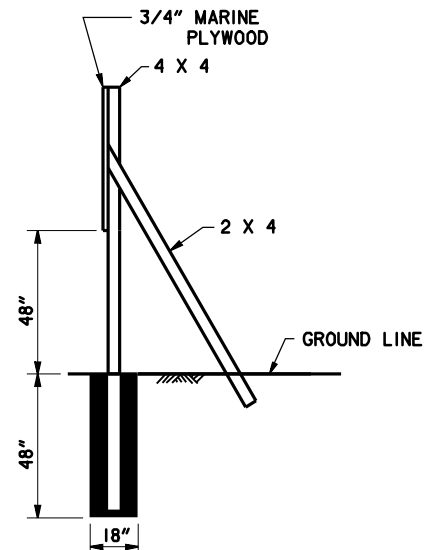
PART 3 EXECUTION (Not Applicable)



ELEVATION



ELEVATION



SECTION A-A

SPECIFICATIONS

- SIGN PANEL SHALL BE 4' x 6' x 3/4" MARINE PLYWOOD OR 22 GAGE SHEET METAL.
- POSTS AND BRACING SHALL BE TREATED, NO.1 GRADE YELLOW PINE.
- ALL EXPOSED SURFACES SHALL BE GIVEN ONE COAT OF LINSEED OIL AND WIPED PRIOR TO PRIMING.
- ALL EXPOSED SURFACES SHALL BE GIVEN ONE COAT OF WHITE AS PRIMER. SECOND COAT SHALL BE COMMUNICATIONS RED ON LEFT AND WHITE ELSEWHERE.
- THE LEFT SECTION SHALL BE RED WITH WHITE LEGEND. THE RIGHT SECTION SHALL BE WHITE WITH BLACK LEGEND.
- PAINT SHALL BE BENJAMIN MOORE NO. 120-60 POLY-SILICONE ENAMEL OR APPROVED
- ALL LETTERING SHALL BE 1/4" EXCEPT FOR THE WORDS "US Army Corps of Engineers" AND THE PROJECT TITLE. THE WORDS "US Army Corps of Engineers" SHALL BE 1/2" TALL. THE PROJECT TITLE LETTERING SHALL BE A MINIMUM OF 1/2" TALL AND A MAXIMUM OF 3/2" TALL. THE LETTERING SIZE SHALL BE CHOSEN SUCH THAT LARGEST POSSIBLE LETTERS ARE USED WITHOUT EXCEEDING A MAXIMUM LINE LENGTH OF 42". THE NUMBER OF LINES IN THE PROJECT TITLE SHALL MATCH THAT SHOWN ON THE COVER SHEET OF THE SPECIFICATIONS.

SCALE: NONE

JUNE 1998

U.S. ARMY ENGINEER DISTRICT, MEMPHIS
CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

**TEMPORARY
PROJECT SIGN**

DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01451b

CONTRACTOR QUALITY CONTROL

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SECTION 01451b

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740 (1994a) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM E 329 (1993b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause entitled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both on-site and off-site, and shall be keyed to the proposed construction sequence.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 21 calendar days after receipt of Notice of Award of the contract, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause entitled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 15 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim

plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC plan shall include, as a minimum, the following to cover all construction operations, both on-site and off-site, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC system manager who shall report to the project manager or someone higher in the Contractor's organization. Project manager in this context shall mean the individual with responsibility for the overall management of the project including quality and production.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters will also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, off-site fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with SPECIAL CONTRACT REQUIREMENT entitled "Submittals".

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, Testing Laboratory and person responsible for each test.

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks and has separate control requirements. It could be identified by different trades or disciplines, or it could be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the QC plan, the Contractor shall notify the Contracting Officer in writing a minimum of seven calendar days prior to any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the Quality Control Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both on-site and off-site work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 CQC System Manager

The Contractor shall identify an individual within his organization at the worksite who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. This CQC System Manager shall be subject to acceptance by the Contracting Officer. The CQC System Manager shall be assigned as System Manager but may have other duties in addition to quality control.

3.4.2 CQC Staff

A staff shall be maintained under the direction of the CQC System Manager to perform all CQC activities. An alternate will be identified to serve in the absence of the CQC System Manager. The staff must be of sufficient size to ensure adequate CQC coverage of all work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned CQC responsibilities and must be allowed sufficient time to carry out these responsibilities. The CQC plan will clearly state the duties and responsibilities of each staff member. All CQC Staff members or replacements shall be subject to acceptance by the Contracting Officer.

3.4.3 Additional Requirement

In addition to the above requirements, the CQC System Manager and his Alternate shall complete the course entitled "Construction Quality Management for Contractors". This course is periodically offered by the Memphis District as well as other Corps Districts.

3.5 SUBMITTALS

Submittals shall be in accordance with SPECIAL CONTRACT REQUIREMENT entitled "Submittals". The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.6 CONTROL

The controls shall include at least three phases of control to be conducted by the CQC System Manager for all definable features of work, as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work and shall include:

- a. A review of each paragraph of applicable specifications.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. A check to assure that provisions have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for constructing the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that phase of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. The Government shall be notified at least 24 hours in advance of beginning any of the required action of the preparatory phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of preliminary work to ensure that it is in compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verification of full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work on-site, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure continuing compliance with contract requirements, including control testing, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon or conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

As determined by the Government, additional preparatory and initial phases may be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, on-site production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site in accordance with paragraph 3.7.2 below. The Contractor shall perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, will be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test will be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an off-site or commercial test facility will be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Laboratory Validation

All testing of soil, gravel, aggregate, stone, concrete, and asphalt shall be performed by a testing laboratory validated by the Material Testing Center (MTC) of the Corps of Engineers. Refer to the MTC website <http://www.wes.army.mil/SL/MTC/ValStatesTbl.htm>. If the Contractor proposes to use a commercial laboratory that is not validated or set up an on-site laboratory, he shall make arrangements for validation by contacting the Materials Testing Center at Waterways Experiment Station, Vicksburg, Mississippi, telephone number: 601-634-3974, www.wes.army.mil/SL/MTC/inspection.htm. The Government will not be responsible for any cost associated with the validation of laboratories that are not currently validated. The validation process could take 30 to 90 days or more. The Contractor shall be responsible for determining the amount of time required for the validation of the proposed laboratory and accounting for this event in his progress schedule. If the Contractor elects to use a non-validated laboratory, work requiring testing shall not commence until the laboratory has been validated by MTC.

3.7.2.2 Capability Check

The Contracting Officer reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.3 Capability Recheck

If the selected laboratory fails the capability check, the Contractor will be assessed a charge to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor. There will be no extension of time allowed due to necessity to perform capability rechecks.

3.7.3 On-Site Laboratory

The Contracting Officer reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered by the Contractor to a location specified by the Contracting Officer.

3.8 COMPLETION INSPECTION

At the completion of all work or any increment thereof established by a completion time stated in the Special Contract Requirements entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a "punch list" of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Government. These inspections and any deficiency corrections required by this paragraph will be accomplished within the time stated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.
- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals reviewed, with contract reference, by whom, and action taken.
- g. Off-site surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and two copies of these records in report form shall be furnished to the Government daily within 24 hours after the date(s) covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every seven days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the worksite, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

DIVISION 2 - SITEWORK

SECTION 02216b

STONE PROTECTION

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SECTION 02216b

STONE PROTECTION

PART 1 GENERAL

1.1 SCOPE

The work covered by this section consists of furnishing all plant, labor, equipment, and materials, and performing all operations in connection with the construction of stone protection, including foundation preparation, placement of filter fabric, placement of bedding material, and placement of riprap as shown on the drawings or as directed by the Contracting Officer in accordance with these specifications and applicable drawings.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for all stone protection testing and operations to assure compliance with contract requirements, and shall maintain records of the quality control for all construction including, but not limited to, the following:

- (1) Foundation preparation (line and grade).
- (2) Inspection at the work site to ensure use of specified materials.
- (3) Filter gradation and placement.
- (4) Riprap gradation and placement.

A copy of these records of inspections and tests as well as the records of corrective action taken, shall be furnished to the Government.

1.3 REFERENCES

The following publication of the issue listed below, but referred to thereafter by basic designation only, forms a part of this specification to the extent indicated by the reference thereto:

US ARMY CORPS OF ENGINEERS, HANDBOOK FOR CONCRETE AND CEMENT (CRD)

CRD-C 106-93 Unit Weight and Voids in Aggregate

CRD-C 107-94 Specific Gravity and Absorption of Coarse Aggregate

1.4 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-01 Data

Equipment; FIO.

List of proposed equipment to be used in performance of construction work including descriptive data.

SD-09 Reports

Sampling and Testing; FIO. Density Test; FIO.

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Test results from samples, not less than 30 days before material is required for the work. Results of laboratory tests for quality control purposes, for approval, prior to using the material.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 General

All stone shall be durable material as approved by the Contractor Officer. The sources from which the Contractor proposed to obtain the material shall be selected well in advance of the time when the material will be required. Stone for riprap shall be of a suitable quality to ensure permanence in the structure and in the climate in which it is to be used. It shall be free from cracks, seams and other defects that would tend unduly to increase its deterioration from natural causes. The inclusion of objectionable quantities of dirt, sand, clay and rock fines will not be permitted.

2.1.2 Sources and Evaluation Testing

Riprap shall be obtained in accordance with the provisions of SPECIAL CONTRACT REQUIREMENT paragraph entitled STONE SOURCES. If the Contractor proposed to furnish riprap from a source not currently listed, the Contractor shall make such investigations as necessary to determine whether acceptable stone can be produced from the proposed source. The Contractor shall submit suitable test reports and service records to show the acceptability of the stone. Satisfactory service records on work outside the Corps of Engineers will be acceptable. If no such records are available, the Contractor shall make tests to assure the acceptability of the stone. The tests to which the stone may be subjected will include petrographic analysis, specific gravity, abrasion, absorption, wetting and drying, freezing and thawing and such other tests as may be considered necessary by the Contracting Officer. The following guidance is provided for use by the Contractor in analyzing a new source of stone. Stone that weighs less than 155 lbs/cf and has more than 2% absorption will not be acceptable unless other tests and services records show that the stone is satisfactory. The method of tests for unit weight will be CRD-C 106, "Standard Test Method for Unit Weight and Voids in Aggregate". The method of tests for absorption will be CRD-C 107, entitled "Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate". Samples shall be taken by the Contractor under the supervision of the Contracting Officer at least 60 days in advance of the time the placing of the stone is expected to begin. The tests will be conducted in accordance with applicable Corps of Engineers methods of tests given in the Handbook for Concrete and Cement, and will be performed at an approved

testing laboratory. The cost of testing will be borne by the Contractor.

2.1.3 Bedding Material

The bedding material for the riprap shall be the aggregate base course as specified in SECTION 02722b, AGGREGATE BASE COURSE.

2.1.4 Riprap

Stone for riprap shall be durable and of a suitable quality to insure permanence in the structure and in the climate in which its is to be used. It shall be free from cracks, seams, and other defects that would tend to increase unduly its deterioration from natural causes. The inclusion of objectionable quantities of dirt, sand, clay, and rock fines will not be permitted. The riprap shall be graded as follows:

TABLE I
(For Riprap "R 90")

<u>Percent Lighter by Weight (SSD)</u>	<u>Limits of Stone Weight, lb.</u>
100	90-40
50	40-20
15	20-5

TABLE II
(For Riprap "R 200")

<u>Percent Lighter by Weight (SSD)</u>	<u>Limits of Stone Weight, lb.</u>
100	200-80
50	80-40
15	40-10

Neither the breadth nor the thickness of any piece of riprap shall be less than 1/3 the length.

2.1.5 Test Method

Gradation test method shall conform to the requirements of "LMVD Standard Test Method for Gradation of Riprap" which is inserted at the end of this section as PLATE II. Also inserted at the end of this section is an Example Gradation, Specifications, and Worksheet (PLATE III), an Example Gradation plotted on ENG Form 4055 (PLATE IV), and an example Gradation Test Data Sheet (PLATE V).

2.1.6 Gradation Test

The Contractor shall perform a gradation test or tests on the riprap at the quarry. The sample shall be taken by the Contractor under the supervision of the Contracting Officer, shall consist of not less than 15 tons of riprap and shall be collected in a random manner which will provide a sample which

accurately reflects the actual gradation arriving at the jobsite. If collected by the truckload, each truckload shall be representative of the gradation requirements. The Contractor shall provide all necessary screens, scales and other equipment, and the operating personnel therefor, and shall grade the samples, provide gradation test sample, data, and plot sheets/forms, all at no additional cost to the Government. A plot of the Gradation Test shall be submitted to the Contracting Officer for approval prior to placement of riprap. A gradation test is required for each 10,000 tons of stone.

PART 3 EXECUTION

3.1 FOUNDATION PREPARATION

Areas on which bedding layers are to be placed shall be trimmed and dressed to conform to cross sections shown on the drawings within an allowable tolerance of plus or minus 2 inches from the theoretical slope lines and grades. Where such areas are below the allowable minus tolerance limit they shall be brought to grade by filling with bedding material and no additional payment will be made for any material thus required. Immediately prior to placing the gravel bedding the prepared base will be inspected by the Contracting Officer and no material shall be placed thereon until that area has been approved.

3.2 FILTER FABRIC

Prior to any placement of bedding material and/or stone protection, geotextile filter fabric shall be placed as shown on the plans and as specified in SECTION 02378b, GEOTEXTILES.

3.3 BEDDING MATERIAL LAYER

Bedding material layers composed of a 4-inch thickness shall be placed on compacted earth subgrade, after the compacted subgrade has been covered with a geotextile filter fabric specified in paragraph 3.2, within the limits shown on the drawings or as staked in the field, to form a backing for the riprap protection. Bedding material shall be spread uniformly on the prepared base, in a satisfactory manner, to the slope lines and grades indicated on the drawings or as directed. Placing of material by methods which will tend to segregate particle sizes within the bedding will not be permitted. Any damage to the surface of the bedding base during placing of the bedding shall be repaired before proceeding with the work. Compaction of the bedding layers will not be required but it shall be finished to present a reasonably even surface free from mounds or windrows.

3.4. RIPRAP

3.4.1 General

Riprap shall be placed on the bedding material layer within the limits shown on the drawings. Riprap shall be as specified in 2.1 above.

3.4.2 Placement

Stone for "riprap" shall be placed on the bedding layers in such manner as to produce a reasonably well-graded mass of rock with the minimum practicable percentage of voids, and shall be constructed within the specified tolerance to the lines and grades shown on the drawings or staked in the field. A

tolerance of plus 2 inches or minus 2 inches from the slope lines and grades shown on the drawings will be allowed in the finished surface of the riprap, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet. Riprap shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the bedding material. The larger stones shall be well distributed and the entire mass of stones in their final position shall be roughly graded to conform to the gradation specified in paragraph 2.1.4 above. The finished riprap shall be free from objectionable pockets of small stones and clusters of larger stones. Placing riprap in layers will not be permitted. Placing riprap by dumping into chutes or by similar methods likely to cause segregation of the various sizes will not be permitted. The desired distribution of the various sizes of stones throughout the mass shall be obtained by selective loading of the material at the quarry or other source; by controlled dumping of successive loads during final placing, or by other methods of placement which will produce the specified results. Rearranging of individual stones by mechanical equipment or by hand will be required to the extent necessary to obtain a reasonably well graded distribution of stone sizes as specified above. The placement or rearrangement of stones for stone protection shall not disturb the geotextile filter fabric specified in paragraph 3.2. Any filter fabric disturbed by the placement or rearrangement of the stone protection shall be replaced by the Contractor at no additional cost to the Government. The Contractor shall maintain the riprap protection until accepted and any material displaced by any cause shall be replaced at his expense to the lines and grades shown on the drawings.

PLATE II

LMVD STANDARD TEST METHOD FOR GRADATION

Select a representative sample (Note #1), weigh and dump on hard stand.

Select specific sizes (see example) on which to run "individual weight larger than" test. (See Note #2). Procedure is similar to the standard aggregate gradation test for "individual weight retained".

Determine the largest size stone in the sample. (100% size)

Separate by "size larger than" the selected weights, starting with the larger sizes. Use reference stones, identified weights, for visual comparison in separating the obviously "larger than" stone. Stones that appear close to the specific weight must be individually weighed to determine size grouping. Weigh each size group, either individually or cumulatively.

Paragraph D above will result in "individual weight retained" figures. Calculate individual percent retained (heavier than) and cumulative percent retained and cumulative percent passing (lighter than). Plot percent passing, along with the specification curve on ENG Form 4055.

NOTES

1. Sample Selection. The most important part of the test and the least precise is the selection of a representative sample. No "standard" can be devised; larger quarry run stone is best sampled at the shot or muck pile by given direction to the loader; small graded riprap is best sampled by random selection from the transporting vehicles. If possible, all parties should take part in the sample selection and agree before the sample is run that the sample is representative.

2. Selection of Size for Separation. It is quite possible and accurate to run a gradation using any convenient sizes for the separation, without reference to the specifications. After the test is plotted on a curve, then the gradation limits may be plotted. Overlapping gradations with this method are no problem. It is usually more convenient, however, to select points from the gradation limits, such as the minimum 50% size, the minimum 15% size, and one or two others as separation points.

PLATE III

EXAMPLE GRADATION- SPECIFICATIONS

Stone Weight in Pounds	Percent Finer by Weight
90 - 40	100
40 - 20	50
20 - 5	15

EXAMPLE GRADATION-WORKSHEET

Stone Size (lbs)	Weight Retained	Individual % Retained	Cumulative % Ret. % Pass	Specification % Finer by wt
90	0	0	-	100
40	9600	30	30	70
20	11,200	35	65	35
5	8000	25	90	10
< 5	3200	10	100	-
Total Weight	32,000 lbs			

Remarks: LARGEST STONE SIZE = 78 lbs

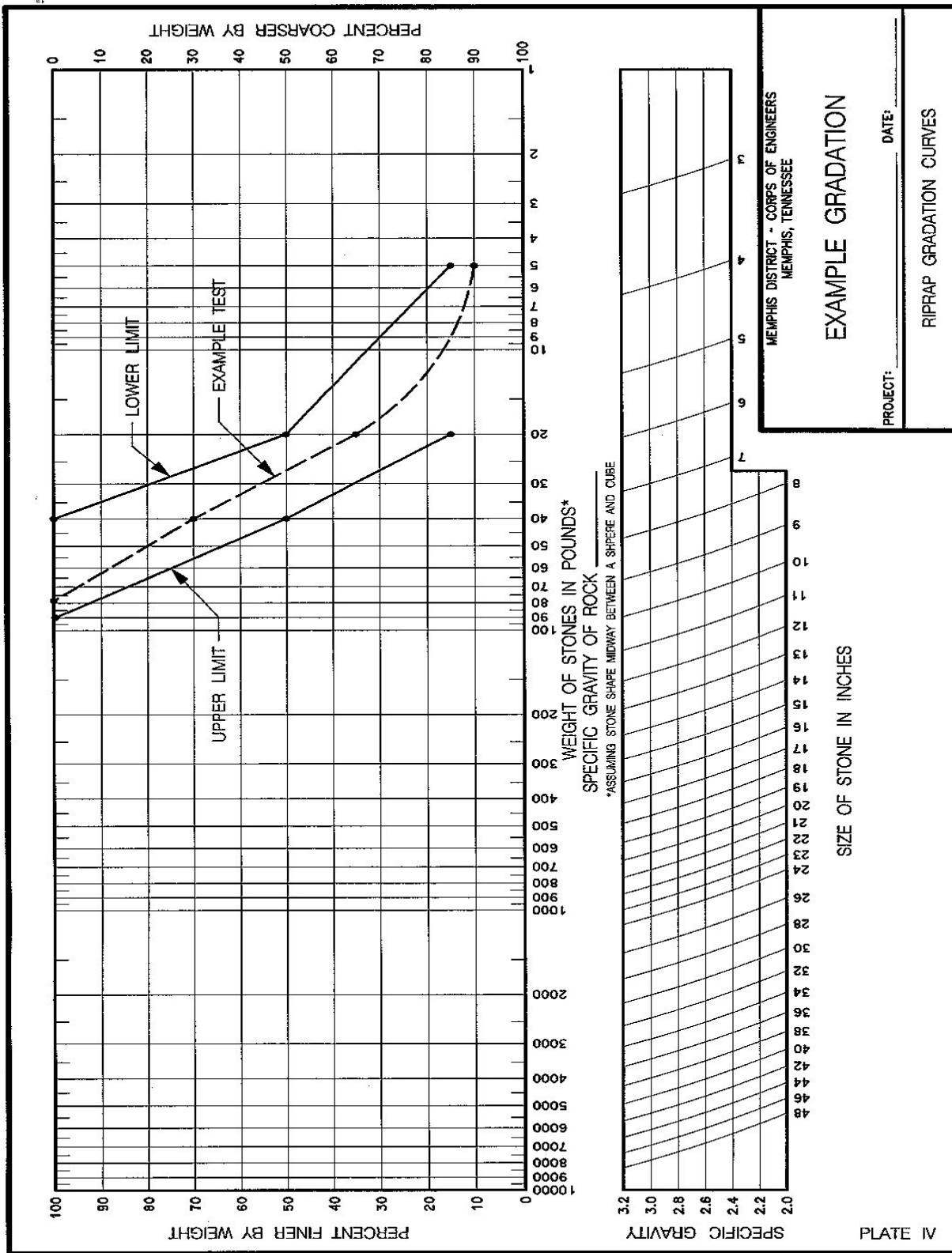


PLATE V

GRADATION TEST DATA SHEET

Quarry _____ Stone Tested _____

Date of Test _____ Testing Rate _____

TEST REPRESENTS

Contract No.	District	Tonne
TOTAL		

GRADATION

Stone Size (lbs)	Weight Retained	Individual % Retained	Cumulative % Ret.	% Pass	Specification % Finer by wt
Total Weight					

Remarks: _____

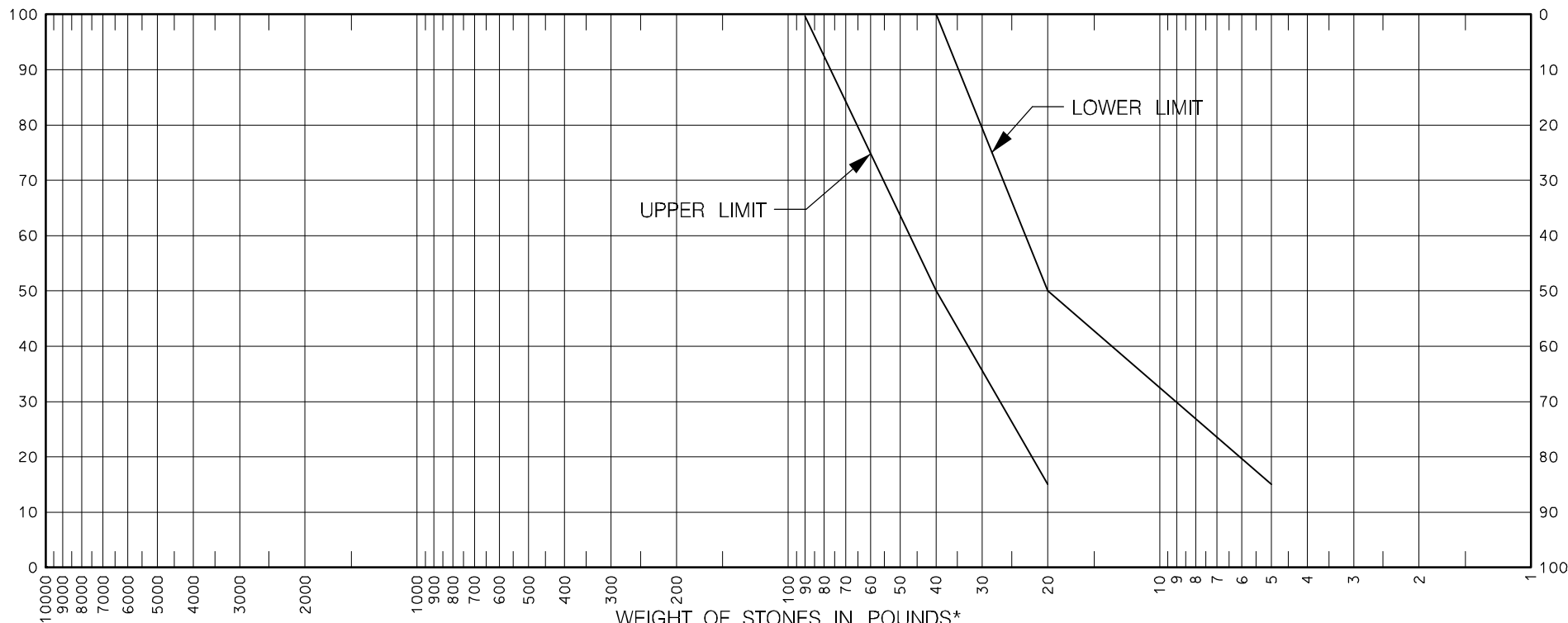
I certify that the above stone sample is representative of the total tonnage covered by this test report.

Contractor Representative _____

Government Representative _____

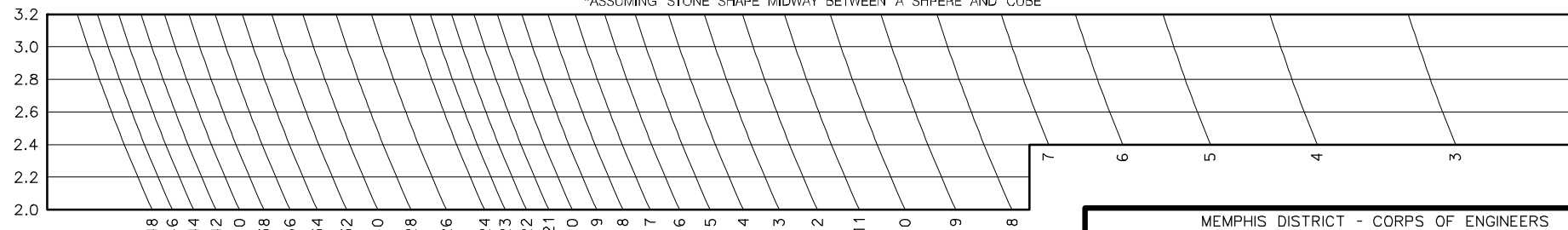
PERCENT FINER BY WEIGHT

PERCENT COARSER BY WEIGHT



WEIGHT OF STONES IN POUNDS*
SPECIFIC GRAVITY OF ROCK _____
*ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE

SPECIFIC GRAVITY



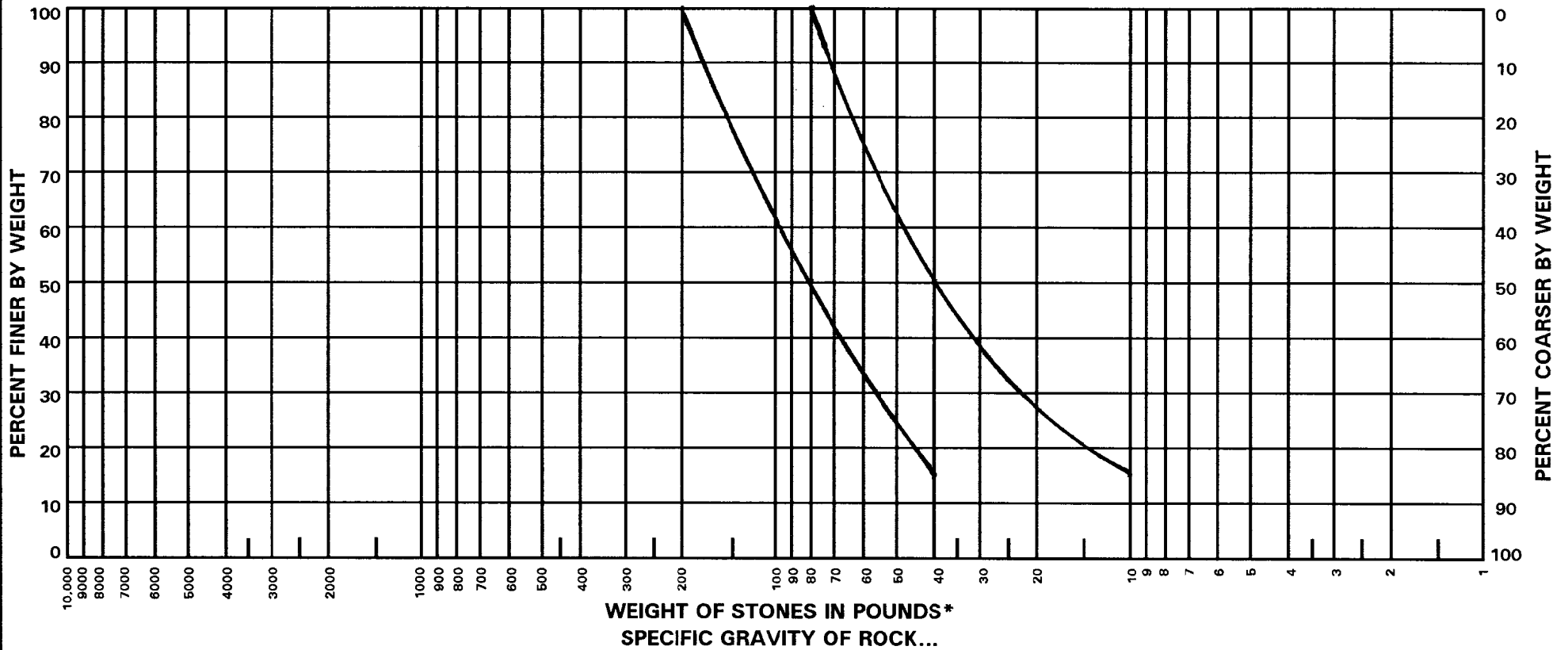
SIZE OF STONE IN INCHES

MEMPHIS DISTRICT - CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

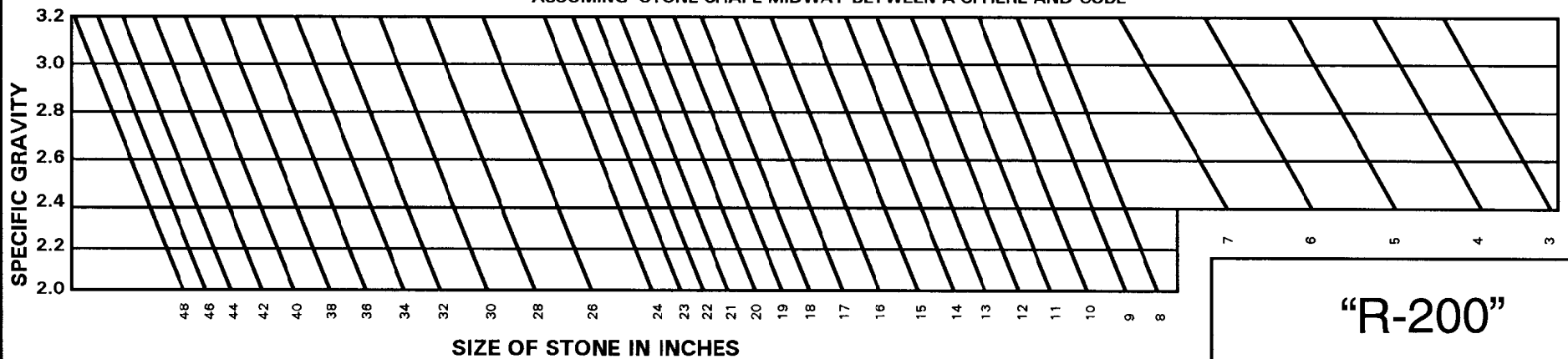
"R-90"

PROJECT: _____ DATE: _____

RIPRAP GRADATION CURVES



*ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE



"R-200"

RIPRAP GRADUATION CURVES

DIVISION 2 - SITE WORK

SECTION 02230b

CLEARING AND GRUBBING

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SECTION 02230b

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Clearing

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.

1.1.2 Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas.

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-18 Records

Materials Other Than Salable Timber; FIO.

Written permission to dispose of such products on private property shall be filed with the Contracting Officer.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLEARING

Any areas, within the limits of the right-of-way that will be affected by the Contractor's construction activities, shall be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface. After clearing, the riprap areas shall be dressed to the typical cross sections shown in the contract plans.

3.2 GRUBBING

Areas to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not

less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract, such as areas for boat ramps, parking lot, and walkways. Depressions made by grubbing shall be filled with acceptable backfill material and compacted to make the surface conform with the original adjacent surface of the ground.

3.3 TREE REMOVAL

Tree stump removal shall be limited to the complete removal and grubbing of the associated root systems for three (3) existing tree stumps located in the area of the existing park area adjacent to the existing boat ramp. See DEMOLITION PLAN for the location of these stumps.

3.4 DISPOSAL OF MATERIALS

3.4.1 General

All debris resulting from clearing and grubbing operations shall be removed from the site in accordance with paragraph REMOVAL FROM SITE OF WORK. The Contractor shall make a reasonable effort to channel merchantable material into the commercial market to make beneficial use of materials resulting from clearing and grubbing operations.

3.4.2 Removal From Site of Work

The Contractor shall remove all of the debris from the site of the work. Such disposal shall comply with all applicable Federal, State and local laws. The Contractor shall, at his option, either retain for his own use or dispose of by sale or otherwise, any such materials of value. The Government is not responsible for the protection and safekeeping of any materials retained by the Contractor. Such materials shall be removed from the site of the work before the date of completion of the work. Such material shall be so placed as not to interfere with roads, drainage or other improvements and in such a manner as to eliminate the possibility of its entering into channels, ditches, or streams. Disposal shall be at a site designated and approved for disposal of such items.

DIVISION 2 - SITE WORK

SECTION 02231b

DEMOLITION

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2.7.1	General
2.7.2	Removal From Site of Work

SECTION 02231b

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ENGINEERING MANUALS (EM)

EM 385-1-1 (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

The work includes demolition and removal of resulting rubbish and debris. Rubbish and debris shall be removed from rights-of-way daily, unless otherwise directed, to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-08 Statements

Work Plan; GA.

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water will not

be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

1.5 PROTECTION

1.5.1 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.2 Environmental Protection

The work shall comply with the requirements of Section 01130b ENVIRONMENT PROTECTION.

1.6 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.7 USE OF EXPLOSIVES

Use of explosives will not be permitted.

PART 2 EXECUTION

2.1 EXISTING STRUCTURES

Existing structures indicated shall be removed to 2 feet below existing grade.

2.2 UTILITIES

When utility lines are encountered that are not indicated on the drawings, the Contracting Officer shall be notified prior to further work in that area.

2.3 FILLING

Holes and other hazardous openings shall be filled in accordance with Section 02300b EARTHWORK.

2.4 DISPOSITION OF MATERIAL

Title to material and equipment to be demolished is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

Concrete, masonry, and other noncombustible material shall be disposed of off of site. Combustible material shall be disposed of in an approved sanitary fill area located off of the site.

2.5 CLEAN UP

Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. State and local regulations regarding hauling and disposal shall apply.

2.6 PAVEMENTS

Existing pavements designated for removal shall be fully removed (sawcut prior to removal in the locations indicated on the drawings) in accordance with the construction details shown on the drawings. The existing boat ramp concrete below elevation 290.0 shall be broken into pieces having a maximum dimension not exceeding 1 foot and will be allowed to remain in place.

2.7 DISPOSAL OF MATERIALS

2.7.1 General

All debris resulting from demolition operations (except the existing boat ramp concrete allowed to remain in place) shall be removed from the site in accordance with paragraph 2.7.2 REMOVAL FROM SITE OF WORK.

2.7.2 Removal From Site of Work

The Contractor shall remove all of the demolition debris from the site of the work. Such disposal shall comply with all applicable Federal, State and local laws. Such materials shall be removed from the site of the work before the date of completion of the work. The Contracting Officer reserves the right to approve or disapprove the use of Contractor-furnished disposal areas based on the location of the areas and a determination of the overall impact the proposed disposal areas will have on the environment or the integrity of the project. Contractor-furnished disposal areas shall not be located in woodlands or wetlands. Disapproval by the Contracting Officer of Contractor-furnished disposal areas shall not form the basis of a claim against the Government.

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SECTION 02234b

DEBRIS CLEAN-UP

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SECTION 02234b

DEBRIS CLEAN-UP

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Debris

Debris shall be understood to pertain to any moveable or non-permanently anchored item (with the exception of rip-rap) that exists within the debris clean-up limits as defined on the DEBRIS CLEAN-UP drawing. To further illustrate, debris items would include (but may not be limited to) the following: cans; product containers; boxes; metal, paper, or plastic containers; food discards; leaves; branches; tree trunks; flotsam; driftwood; tires; animal carcasses; appliances; abandoned man-made products; etc.

1.2 PROJECT/SITE CONDITIONS

1.2.1 Existing Conditions

1.2.1.1 Boundaries

The area to be cleared under this section possesses the general work limits as defined below and as indicated on the drawings, which form a part of this contract.

- a. Debris shall be cleaned-up and removed from the levee embankment, as defined within the area that runs in-between Baseline "A", Station 100+25 (as indicated on the Debris Clean-Up drawing) on the west end of the project, and Baseline "A", Station 129+00 (as indicated on the Debris Clean-Up drawing) on the east end of the project. The south boundary is "0" on the river gauge, elevation 255.00.

PART 2 EXECUTION

2.1 BRUSH AND GRASSES

2.1.1 Removal

All brush and grasses shall be sprayed with a herbicide 2 weeks prior to the cutting and removing each to a height that is flush with the existing grade. Remove downed brush and grasses from the site.

2.2 DISPOSAL OF MATERIAL

2.2.1 General

The debris material that is cleaned-up from the levee embankment shall be completely removed by transporting from the rights-of-way. All debris will become the property of the Contractor. In no case shall material removed

from within in the debris clean-up area be thrown into or left in the river. Clean-up of floatable debris immediately adjacent to the work limits and in the river, shall be accomplished by any practical means.

2.2.2 Burning

Burning shall not be permitted.

2.2.3 Removal From Site

The Contractor shall remove all brush and debris cleaned-up from the levee embankment work site to approved locations. The Government will assume no responsibility for the protection and safekeeping of such material.

2.3 MARKETABLE MATERIALS

Any of the materials contained in the levee embankment clean-up shall become the contractor's property and shall be removed from the levee embankment / project site area.

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SECTION 02300b

EARTHWORK

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EARTHWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 33	(1990) Specification for Concrete Aggregates
ASTM D 422	(1963; R 1990) Particle-Size Analysis of Soils
ASTM D 1140	(1992) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 1557	(1991) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu. m.))
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1993) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1995a) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-08 Statements

Earthwork; FIO.

Procedure and location for disposal of unused satisfactory material.

SD-09 Reports

Testing; FIO.

Within 24 hours of conclusion of physical tests, 4 copies of test results, including calibration curves and results of calibration tests.

SD-13 Certificates

Testing; FIO.

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

1.3 SUBSURFACE DATA

Subsurface soil boring logs are included in the CONTRACT DRAWINGS. The subsoil investigation report may be examined at the U. S. Army Corps of Engineers, Memphis District, Tennessee. Variations may exist in the subsurface between boring locations.

1.4 CLASSIFICATION OF EXCAVATION

No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation.

1.5 BLASTING

Blasting will not be permitted.

1.6 UTILIZATION OF EXCAVATED MATERIALS

Satisfactory material removed from excavations shall be used, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

PART 2 MATERIALS

Classification of soils will be in accordance with ASTM D 2487. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.

2.1 GENERAL

The origin of any fill material in no way determines where it may be used in the embankment. The intention is to use the most suitable materials obtainable from these sources. Commercial earth products, e.g., graded sand/pervious material may be procured by the Contractor from offsite

source. Material to be wasted shall be clearly identified and segregated from suitable materials at the time the material is excavated. Materials containing brush, roots, sod or other perishable materials will not be considered suitable for fill or backfill. The suitability of the materials shall be subject to approval and their disposition in the embankment will be as directed.

2.1.1 Impervious Fill and Backfill

Materials for impervious fill and backfill shall consist of clays obtained from the required excavation and classified by ASTM D 2487 as CH or CL. Impervious fill shall be used for parking lots and all ramps.

2.1.2 Pervious Backfill

Material for general pervious backfill shall be clean, free draining sand conforming to ASTM C 33 with gradation as shown below:

Pervious Backfill Gradation

U.S. Standard Sieve	Percent Passing, by Weight
3/8 in.	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

2.1.3 Topsoil

Material suitable for topsoil as defined in ASTM D 5268 is defined as dark-colored, fine, silty or sandy soils with a high content of well decomposed organic matter.

2.1.4 Select Backfill

Material for select backfill shall be CL, SC or SM. It shall have a liquid limit less than 45 and a plasticity index less than 25.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

All topsoil shall be stripped to a depth of 4 inches. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations.

3.2 EXCAVATION

Excavation shall conform to the dimensions and elevations indicated for each structure and footing except as specified, and shall include trenching for utility and foundation drainage systems to a point 5 feet beyond the building line of each structure and all work incidental thereof. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms. Excavations below indicated depths will not be permitted except to remove unsatisfactory material. Unsatisfactory material encountered below the grades shown shall be replaced with satisfactory material; and payment will be made in conformance with the CHANGES clause of the CONTRACT CLAUSES. Satisfactory material removed below the depths indicated, without specific direction of the Contracting Officer, shall be replaced, at no additional cost to the Government, with satisfactory materials to the indicated excavation grade; except that concrete footings shall be increased in thickness to the bottom of the overdepth excavations. Satisfactory material shall be placed and compacted as specified in paragraph FILLING AND BACKFILLING. Determination of elevations and measurements of approved overdepth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Contracting Officer.

3.2.1 Lines and Grades

The surface of excavations and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to smoothness suitable for the application of turfing materials.

3.2.2 UTILITY AND DRAIN TRENCHES

Trenches for underground utilities systems and drain lines shall be excavated to the required alignments and depths. The bottoms of trenches shall be graded to secure the required slope and shall be tamped if necessary to 75% density to provide a firm pipe bed. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length.

3.2.3 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Excavation to final grade shall not be made until just before concrete is to be placed. Approximately level surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond. All surfaces shall be protected from erosion resulting from ponding or flow of water.

3.3 DRAINAGE

Surface water shall be directed away from excavation and construction sites to prevent erosion and undermining of foundations. All construction will be performed in the dry. Diversion ditches, dikes and grading shall be provided and maintained as necessary during construction. Excavated slopes and backfill surfaces shall be protected to prevent erosion and sloughing.

Excavation shall be performed so that the site, the area immediately surrounding the site, and the area affecting operations at the site shall be continually and effectively drained.

3.4 SHORING

Shoring, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Shoring shall comply with the requirements of EM 385-1-1 SAFETY AND HEALTH REQUIREMENTS MANUAL. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving.

3.5 BORROW MATERIAL

Offsite borrow material shall be selected to meet the requirements and conditions of the particular fill, backfill or embankment for which it is to be used. The Government shall furnish Borrow material areas to the Contractor. The Contractor shall select suitable material from the Government furnished borrow for the end use being constructed. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval from the Contracting Officer.

3.6 FROZEN MATERIAL

Fill, backfill or embankment shall not be placed on a foundation which contains frozen material, or which has been subjected to freeze-thaw action. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades (whether in an excavation or on an embankment) and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earth fill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, winter shutdowns, or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material at no cost to the Government. Alternatively, the material may be thawed, dried, reworked, and recompacted to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of backfill shall cease due to cold weather. The Contracting Officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Embankment material shall not contain frozen clumps of soil, snow, or ice.

3.7 SUBGRADE PREPARATION

Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill. Material shall not

be placed on surfaces that are muddy, frozen, or contain frost. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Minimum subgrade density shall be as specified in paragraph FILLING AND BACKFILLING.

3.8 FILLING AND BACKFILLING

Satisfactory materials shall be used in bringing fills and backfills to the lines and grades indicated and for replacing unsatisfactory materials. Satisfactory materials shall be placed in horizontal layers not exceeding 8 inches in loose thickness, or 6 inches when hand-operated compactors are used. This operation shall include plowing, disking and any moistening or aeration required to obtain specified compaction. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade. Backfill shall not be placed in wet or frozen areas. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and 1 foot above other utility lines shall be free from stones larger than 1 inch in any dimension. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes to avoid damage to coatings or wrappings. Each layer of fill and backfill shall be compacted to not less than the percentage of maximum density specified below:

	Percent Laboratory maximum density	
	Cohesive material	Cohesionless material
<hr/>		
Fill, embankment, and backfill		
<hr/>		
Under sidewalks and grassed areas	85	90
Nonfrost susceptible materials		95
Subgrade		
<hr/>		
Under sidewalks, top 6 inches	85	90

Compacted subgrades that are disturbed by the Contractor's operations or adverse weather shall be scarified and compacted as specified herein before

to the required density prior to further construction thereon. Recomposition over underground utilities and heating lines shall be by hand tamping.

3.9 COMPACTED BACKFILLS

3.9.1 Foundation Preparation

The surface on which compacted backfill is to be placed shall be cleared of any live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up to a depth of 6 inches; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for impervious materials or 95 percent laboratory maximum density for pervious materials based on ASTM D 1557. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of backfill materials to assure adequate bond between the backfill material and the prepared excavated surface.

3.9.2 Placement

All backfill designated as "compacted" on the contract drawings shall be placed and compacted to at least 90 percent laboratory maximum density for impervious materials or 95 percent laboratory maximum density for pervious materials based on ASTM D 1557. Limits of all backfill materials to be compacted are shown on the Contract Drawings. The materials for compacted fill shall be placed or spread in layers not more than 8 inches in loose thickness prior to compaction. When the surface of any compacted layer is too smooth to bond properly with the succeeding layer, it shall be adequately scarified before the next layer is placed thereon. The topsoil placed over the riprap shall be semicompacted.

3.9.3 Moisture Control

The Contractor shall control the moisture content of the compacted fill or backfill. The optimum moisture content shall be determined by the Contractor from representative samples of each type of material in accordance with ASTM D 698, with at least one test performed for each 5000 cubic yards of fill or backfill placed. Optimum moisture test results shall be furnished to the Contractor Officer prior to placing material. Material placed in the fill shall have a moisture content ranging between the following limits above and below the optimum moisture content:

TYPE OF MATERIAL	MOISTURE CONTENT (IN PERCENT DRY DENSITY)	
	MAXIMUM	MINIMUM
Impervious (CH)	+3%	-3%
Impervious (CL)	+3%	-3%
Random	+3%	-2%

NOTE: See Unified Soil Classification Chart for explanation of symbols and Plasticity Chart for classification determination, both shown on the contract drawings.

The Contractor shall perform the necessary work in moisture control to bring the material to a moisture content within the range specified above in order that compaction requirements can be met. If the material is too

wet, it shall either be stockpiled and allowed to drain before it is placed and/or the wet material shall be processed by discing and harrowing, if necessary, until the moisture content is reduced sufficiently. If the material is too dry, sufficient moisture shall be uniformly distributed in each layer before compacting.

3.10 PLACING TOPSOIL

On areas to receive topsoil (any previously vegetated area disturbed by the Contractor's construction activities), the compacted subgrade soil shall be scarified to a 2-inch depth for bonding of topsoil with subsoil. See Contract Plans for typical section over riprap. Topsoil then shall be spread evenly to a thickness of 4 inches and graded to the elevations and slopes shown. Topsoil shall not be spread when frozen or excessively wet or dry. Material required for topsoil in excess of that produced by excavation within the grading limits shall be obtained from offsite areas.

3.11 TESTING

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. The first inspection will be at the expense of the Contractor. Cost incurred for any subsequent inspections required because of failure of the first inspection will be charged to the Contractor. Field in-place density shall be determined in accordance with ASTM D 2922. When ASTM D 2922 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 2922 results in a wet unit weight of soil and when using this method ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017; the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation. Testing, whether by contractor or commercial facility, must be by a pre-validated facility as described in Section 01451b.

3.11.1 Fill and Backfill Material Gradation

One test per 500 cubic yards stockpiled or in-place source granular material. Gradation of fill and backfill material shall be determined in accordance with ASTM D 422.

3.11.2 In-Place Densities

- a. One test per 500 square feet, or fraction thereof, of each 8" lift of fill or backfill areas compacted by other than hand-operated machines.
- b. One test per 100 square feet, or fraction thereof, of each 6" lift of fill or backfill areas compacted by hand-operated machines.
- c. One test per 50 linear feet, or fraction thereof, of each lift of embankment or backfill for roads.

3.11.3 Check Tests on In-Place Densities

If nuclear method (ASTM D 2922) is used, in-place densities shall be checked by sand-cone method (ASTM D 1556) as follows:

- a. One check test per lift for each 2500 square feet, or fraction thereof, of each 8" lift of fill or backfill compacted by other than hand-operated machines.
- b. One check test per lift for each 500 square feet, of each 6" lift of fill or backfill areas compacted by hand-operated machines.
- c. One check test per lift for each 500 linear feet, or fraction thereof, of embankment or backfill for roads.

3.11.4 Moisture Contents

In the stockpile, excavation, or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions shall be performed. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.

3.11.5 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 1000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.11.6 Tolerance Tests for Subgrades

Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

3.12 SUBGRADE AND EMBANKMENT PROTECTION

During Construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operations and shall be protected and maintained by the Contractor in a satisfactory condition until subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course or

pavement shall be laid until the subgrade has been verified to comply with compaction, line and grade requirements. In no case shall subbase, base surfacing, or pavement be placed on a muddy, spongy, or frozen subgrade.

DIVISION 2 - SITE WORK

SECTION 02370b

SOIL EROSION CONTROL

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SECTION 02370b

SOIL SURFACE EROSION CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AGRICULTURAL MARKETING SERVICE (AMS)

AMS Seed Act (1995) Federal Seed Act Regulations Part 201

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 39 (1996) Compressive Strength of Cylindrical Concrete Specimens

ASTM C 42 (1999) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C 140 (1999b) Sampling and Testing Concrete Masonry Units

ASTM D 648 (1998c) Deflection Temperature of Plastics Under Flexural Load

ASTM D 698 (1998) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600kN-m/cu. m))

ASTM D 1682 Tensile Strength and % Strength Retention of material after 1000 hours of exposure in Xenon Arc Weatherometer

ASTM D 1777 (1996) Thickness of Textile Materials

ASTM D 2844 (1994) Resistance R-Value and Expansion Pressure of Compacted Soils

ASTM D 3776 (1996) Mass per Unit Area (Weight) of Fabric

ASTM D 3787 (1989) Bursted Strength of Knitted Goods: Constant-Rate-of-Traverse (CRT), Ball Burst Test

ASTM D 3884 (1992) Test Method for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double Head Method)

ASTM D 4355	(1992) Deterioration of Geotextiles From Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1999) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1991; R 1996) Trapezoidal Tearing Strength of Geotextiles
ASTM D 4595	(1986; R 1994) Tensile Properties of Geotextiles by the Wide-Width Strip Method
ASTM D 4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1999) Determining Apparent Opening Size of a Geotextile
ASTM D 4833	(1998; R 1996el) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4972	(1995a) pH of Soils
ASTM D 5035	(1995) Breaking Force and Elongation of Textile Fabrics (Strip Method)
ASTM D 5268	(1996) Topsoil Used for Landscaping Purposes

1.2 DESCRIPTION OF WORK

The work shall consist of furnishing and installing soil surface erosion control materials in combination with sod (see section 02922b SODDING), including fine grading, blanketing, stapling, mulching and miscellaneous related work, within project limits and in areas outside the project limits where the soil surface is disturbed from work under this contract at the designated locations. This work shall include all necessary materials, labor, supervision and equipment for installation of a complete system. This section shall be coordinated with the requirements of Section 02300b EARTHWORK and Section 02922b SODDING.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-01 Product Data

Geotextile Fabrics;

Manufacturer's literature including physical characteristics, application and installation instructions.

SD-04 Shop Drawings

Layout;
Obstructions Below Ground;
Erosion Control;

Scale drawings defining areas to receive recommended materials as required by federal, state or local regulations.

Maintenance Record;

Record of maintenance work performed, of measurements and findings for product failure, recommendations for repair, and products replaced.

SD-09 Test Reports

Erosion Control Blankets

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

Sieve test results. Sand shall be uniformly graded.

SD-13 Certificates

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following.

For items listed in this section:

- a. Certification of recycled content or,
- b. Statement of recycled content.
- c. Certification of origin including the name, address and telephone number of manufacturer.

Installer's Qualification;

The installer's company name and address; training and experience and or certification.

Recycled Plastic;

Individual component and assembled unit structural integrity test; creep tolerance; deflection tolerance; and vertical load test results. The estimated percentage of recovered material content in the material and components. Life-cycle durability.

SD-14 Samples

Materials;

- a. Erosion control blankets; 6 inches by 6 inches square.

SD-19 Operation and Maintenance Data

Maintenance Instructions;

Instruction for year-round care of installed material. The Contractor shall include manufacturer supplied spare parts.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

Materials shall be stored in designated areas and as recommended by the manufacturer protected from the elements, direct exposure, and damage. Containers shall not be dropped from trucks. Material shall be free of defects that would void required performance or warranty.

- a. Erosion control blankets shall be furnished in rolls with suitable wrapping to protect against moisture and extended ultraviolet exposure prior to placement. Erosion control blanket rolls shall be labeled to provide identification sufficient for inventory and quality control purposes.

1.5 SUBSTITUTIONS

Substitutions will not be allowed without written request and approval from the Contracting Officer.

1.6 INSTALLER'S QUALIFICATION

The installer shall be certified by the manufacturer for training and experience installing the material.

1.7 WARRANTY

Erosion control material shall have a warranty for use and durable condition for project specific installations. Temporary erosion control materials shall carry a minimum eighteen month warranty. Permanent erosion control materials shall carry a minimum three year warranty.

PART 2 PRODUCTS

2.1 EROSION CONTROL BLANKETS

2.1.1 Erosion Control Blankets Type IX (Turf Reinforcement Mat)

Permanent erosion control/turf reinforcement mat is constructed of 100 percent coconut fiber stitch bonded between a heavy duty UV stabilized bottom net, and a heavy duty UV stabilized cuspatated (crimped) middle netting overlaid with a heavy duty UV stabilized top net. The cuspatated netting forms prominent closely spaced ridges across the entire width of the mat. The three nettings are stitched together on 1.5 inch centers with UV stabilized polypropylene thread to form a permanent three dimensional structure. The following list contains further physical properties of the turf erosion control mat.

Property	Test Method	Value	Units
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Ground Cover	Image Analysis	93	percent
Thickness	ASTM D 1777		0.63 in
Mass Per Unit Area	ASTM D 3776		0.92 lb/sy
Tensile Strength	ASTM D 5035		480 lb/ft
Elongation	ASTM D 5035		percent
Tensile Strength	ASTM D 5035		960 lb/ft
Elongation	ASTM D 5035	31	percent
Tensile Strength	ASTM D 1682		177 lbs
Elongation	ASTM D 1682	22	percent
Resiliency	ASTM D 1777	greater than 80	percent
UV Stability*	ASTM D 4355		151 lbs
		86	percent
Color(permanent net)		UV Black	
Porosity(permanent net)Calculated		greater than 95	percent
Minimum Filament Measured Diameter (permanent net)			0.03 in

NOTE 1: *ASTM D 1682 Tensile Strength and percent Strength Retention of material after 1000 hours of exposure in Xenon-Arc Weatherometer

NOTE 2: Photodegradable life a minimum of 36 months with a minimum 90 percent light penetration. Apply to slopes up to a maximum 1:1 gradient.

2.1.2 Staking

Stakes shall be 100 percent biodegradable manufactured from recycled plastic or wood and shall be designed to safely and effectively secure erosion control blankets for temporary or permanent applications. The biodegradable stake shall be fully degradable by biological activity within a reasonable time frame. The bio-plastic resin used in production of the biodegradable stake shall consist of polylactide, a natural, completely biodegradable substance derived from renewable agricultural resources. The biodegradable stake must exhibit ample rigidity to enable being driven into hard ground, with sufficient flexibility to resist shattering. The biodegradable stake shall have serrations on the leg to increase resistance to pull-out from the soil.

2.1.3 Staples

Staples shall be as recommended by the manufacturer.

2.2 WATER

Water shall be the responsibility of the Contractor. Water shall be potable.

PART 3 EXECUTION

3.1 CONDITIONS

The Contractor shall submit a construction work sequence schedule, with the approved erosion control plan a minimum of 30 days prior to start of construction. The work schedule shall coordinate the timing of land disturbing activities with the provision of erosion control measures. Erosion control operations shall be performed under favorable weather conditions; when excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped as directed. Erosion control materials shall not be applied in adverse weather conditions which could affect their performance.

3.1.1 Finished Grade

The Contractor shall verify that finished grades are as indicated on the drawings; finish grading and compaction shall be completed in accordance with Section 02300b "Earthwork", prior to the commencement of the work. The location of underground utilities and facilities in the area of the work shall be verified and marked. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

3.1.2 Placement of Erosion Control Blankets

Before placing the erosion control blankets, ensure the subgrade has been graded smooth; has no depressed, void areas; is free from obstructions, such as tree roots, projecting stones or other foreign matter. Before erosion control blankets are placed over riprap, the voids in the riprap shall be filled with aggregate base course. The aggregate base course shall be not less than 3" above the riprap and dressed to the typical sections shown on the contract plans. Vehicles shall not be permitted directly on the blankets.

3.2 SITE PREPARATION

3.2.1 Soil Test

Soil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size and mechanical analysis. Sample collection onsite shall be random over the entire site. The test shall determine the soil particle size as compatible for the specified material.

3.2.2 Protecting Existing Vegetation

When there are established lawns in the work area, the turf shall be covered and/or protected or replaced after construction operations. Existing trees, shrubs, and plant beds that are to be preserved shall be barricaded along the dripline. Damage to existing trees shall be mitigated by the Contractor at no additional cost to the Government. Damage shall be assessed by a state certified arborist or other approved professional using the National Arborist Association's tree valuation guideline.

3.3 INSTALLATION

3.3.1 Erosion Control Blankets

- a. Erosion control blankets shall be oriented in vertical strips and anchored with staples, as indicated. Adjacent strips shall be

abutted to allow for installation of a common row of staples. Horizontal joints between erosion control blankets shall be overlapped sufficiently to accommodate a common row of staples with the uphill end on top.

b. Where exposed to overland sheet flow, a trench shall be located at the uphill termination. The erosion control blanket shall be stapled to the bottom of the trench. Backfill and compact the trench as required.

c. Where terminating in a channel containing an installed blanket, the erosion control blanket shall overlap installed blanket sufficiently to accommodate a common row of staples.

3.4 CLEAN-UP

Excess material, debris, and waste materials shall be disposed offsite at an approved landfill or recycling center. Adjacent paved areas shall be cleared. Immediately upon completion of the installation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.5 MAINTENANCE

Maintenance shall include eradicating weeds; protecting embankments and ditches from surface erosion; maintaining the performance of the erosion control materials and mulch; protecting installed areas from traffic.

3.5.1 Maintenance Instructions

Written instructions containing drawings and other necessary information shall be furnished, describing the care of the installed material; including, when and where maintenance should occur, and the procedures for material replacement.

3.5.2 Patching and Replacement

Unless otherwise directed, material shall be placed, seamed or patched as recommended by the manufacturer. Material not meeting the required performance as a result of placement, seaming or patching shall be removed from the site. The Contractor shall replace the unacceptable material at no additional cost to the Government.

DIVISION 2 - SITE WORK

SECTION 02378b

GEOTEXTILES

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SECTION 02378b

GEOTEXTILES USED AS FILTERS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 123	(1993a) Standard Terminology Relating to Textiles
ASTM D 1683	(1990a) Test Method for Failure in Sewn Seams of Woven Fabrics
ASTM D 3786	(1987) Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method
ASTM D 4354	(1989) Sampling of Geosynthetic for Testing
ASTM D 4355	(1992) Deterioration of Geotextile from Exposure to Ultraviolet light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1992) Water Permeability of Geotextiles By Permittivity
ASTM D 4533	(1996) Standard Test Method for Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1991) Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1993) Determining the Apparent Opening Size of a Geotextile
ASTM D 4833	(1988) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873	(1988) Guide for Identification, Storage, and Handling of Geotextiles
ASTM D 4884	(1990) Seam Strength of Sewn Geotextiles

1.2 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The

following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-13 Certificates

Geotextile; FIO.

All brands of geotextile and all seams to be used shall be accepted on the basis of mill certificates or affidavits. The Contractor shall furnish the Contracting Officer, in duplicate, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile. The mill certificate or affidavit shall attest that the geotextile meets the chemical, physical and manufacturing requirements stated in this specification.

1.3 SHIPMENT, HANDLING, AND STORAGE

1.3.1 Shipment and Storage

Only approved geotextile shall be delivered to the project site. All geotextile shall be labeled, shipped, stored, and handled in accordance with ASTM D 4873. No hooks, tongs, or other sharp instruments shall be used for handling geotextile.

2 PRODUCTS

2.1 MATERIALS

2.1.1 Geotextile

2.1.1.1 General

The geotextile shall be a non-woven pervious sheet of plastic yarn as defined by ASTM D 123. The geotextile shall equal or exceed the minimum average roll values listed in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE. Strength values indicated in the table are for the weaker principal direction.

TABLE 1
MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE

PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
GRAP STRENGTH	lb	120	ASTM D 4632
PUNCTURE	lb	70	ASTM D 4833
BURST STRENGTH	psi	240	ASTM D 3786
TRAPEZOID TEAR	lb	50	ASTM D 4533
PERMEABILITY	gal/min/ft ²	120	ASTM D 4491
APPARENT OPENING SIZE	U.S. SIEVE	70	ASTM D 4751
PERMITTIVITY	sec ⁻¹	1.5	ASTM D 4491

ULTRAVIOLET DEGRADATION	Percent	50 AT 500 Hrs	ASTM D 4355
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2.1.1.2 Geotextile Fiber

Fibers used in the manufacturing of the geotextile shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of polyolefins, polyesters, or polamides. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

2.1.2 Seams

The seams of the geotextile shall be sewn with thread of a material meeting the chemical requirements given above for geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or another approved location. Seams shall be tested in accordance with method ASTM D 1683. The strength of the seam shall be not less than 90 percent of the required grab tensile strength of the unaged geotextile in any principal direction.

2.1.3 Securing Pins

The geotextile shall be secured to the foundation soil by pins to prevent movement prior to placement of wall drain materials. Other appropriate means to prevent movement such as staples, sand bags, and stone could also be used. Securing pins shall be inserted through both strips of overlapped geotextile along the line passing through midpoints of the overlap. Securing pins shall be removed as placement of wall drain materials are placed to prevent tearing of geotextile or enlarging holes. Maximum spacing between securing pins shall be 5 feet. When windy conditions prevail at the construction site, the number of pins should be increased upon the demand of the Contracting Officer.

2.2 INSPECTIONS, VERIFICATIONS, AND TESTING

2.2.1 Manufacturing and Sampling

Geotextiles and factory seams shall meet the requirements specified in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR DRAINAGE GEOTEXTILE. Geotextiles shall be randomly sampled in accordance with ASTM D 4354 (Procedure Method A). Factory seams shall be sampled at the frequency specified in ASTM D 4884.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

Surface on which the geotextile will be placed shall be prepared, to a relatively smooth surface condition, in accordance with the applicable portion of this specification and shall be free from obstruction, debris, depressions, erosion feature, or vegetation. Any irregularities will be removed so as to insure continuous, intimate contact of the geotextile with

all the surface. Any loose material, soft or low density pockets of material, will be removed; erosion features such as rills, gullies etc. must be graded out of the surface before geotextile placement.

3.2 INSTALLATION OF THE GEOTEXTILE

3.2.1 General

The geotextile shall be placed in the manner and at the locations shown. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage.

3.2.2 Placement

The geotextile shall be laid smooth and free of tension, stress, folds, wrinkles, or creases. The strips shall be placed to provide a minimum width of 24 inches of overlap for each joint. The Contractor shall adjust the actual length of the geotextile used based on initial installation experience. Temporary pinning of the geotextile to help hold it in place until the filter layer is placed shall be allowed. The temporary pins shall be removed as the filter is placed to relieve high tensile stress which may occur during placement of material on the geotextile. Trimming shall be performed in such a manner that the geotextile shall not be damaged in any way.

3.3 PROTECTION

The geotextile shall be protected at all times during construction from contamination by surface runoff and any geotextile so contaminated shall be removed and replaced with uncontaminated geotextile. Any damage to the geotextile during its installation or during placement of granular filter materials shall be replaced by the Contractor at no cost to the Government. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 7 calendar days after placement of the geotextile. Failure to comply shall require replacement of geotextile. The geotextile shall be protected from damage prior to and during the placement of riprap or other materials. Before placement of filter materials, the Contractor shall demonstrate that the placement technique will not cause damage to the geotextile. In no case shall any type of equipment be allowed on the unprotected geotextile.

3.4 PLACEMENT OF FILTER MATERIAL

Placing of filter material shall be performed in a manner to insure intimate contact of the geotextile with the prepared surface and with the filter material. The placement shall also be performed in a manner that shall not damage the geotextile including tear, puncture, or abrasion. On sloping surfaces the filter material shall be placed from the bottom of the slopes upward. During placement, the height of the drop of riprap material shall not be greater than 12 inches. Any geotextile damaged beneath the filter material shall be uncovered as necessary and replaced at no cost to the Government.

3.5 OVERLAPPING AND SEAMING

3.5.1 Overlapping

The overlap of geotextile rolls shall be 24 inches. Appropriate measures will be taken to insure required overlap exists after cushion placement.

DIVISION 2 - SITEWORK

SECTION 02710b

ASPHALTIC CONCRETE PAVEMENT

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SECTION 02710b

ASPHALTIC CONCRETE PAVEMENT

1 GENERAL

1.1 DESCRIPTION

This item shall consist of furnishing and placing an asphalt binder course on an accepted base course and placing an asphalt surface course on an accepted asphalt binder course to these specifications and in reasonably close conformity with the lines, grades and typical cross sections shown on the plans.

1.2 REFERENCES

The publication listed below form a part of this specification to the extent referenced. The publication is referred to in the text by basic designation only.

MISSOURI DEPARTMENT OF TRANSPORTATION DEPARTMENT (MoDOT)

MoDOT Standard Specifications Missouri Standard Specifications for
Highway Construction, Edition of 1999

1.3 GENERAL REQUIREMENTS

Work under this section shall be in accordance with Section 403 - ASPHALTIC CONCRETE PAVEMENT of the MoDOT Standard Specifications, except as modified or augmented herein.

1.4 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The Following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES.

SD-09 Reports

Asphalt Mix Design; FIO
Quality Control Of Asphalt Mix; FIO

Design and quality control of mix shall meet the requirements of the specifications.

SD-13 Certificates

Asphalt Mix Design; FIO

Materials shall be certified for compliance with all specification requirements.

SD-18 Records

Pre-Placement Conference; FIO

Contractor shall conduct a Pre-placement Conference and provide minutes of meeting.

Asphalt Mix Design; FIO

Contractor shall furnish one mix design for each of the particular asphalt mixtures listed.

Reference Type Surface Type 1C Table 1 Section 403

2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall be as specified in Section 403.9 Bituminous Mixing Plants, 403.10 Hauling Equipment, 403.11 Pavers, and 403.12 Rollers of the MoDOT Standard Specifications, except as modified or augmented herein.

3 EXECUTION

3.1 CONSTRUCTION METHODS

Construction methods shall be in accordance with Section 403.12, 403.18 Compaction, 403.19 Joints, 403.2 Surface Test and 403.21 Testing Pavement of the MoDOT Standard Specifications.

3.2 SEASONAL AND TEMPERATURE LIMITATIONS

The placing and mixing of Asphaltic Concrete Pavement shall comply with the requirements of paragraph 403.13, Section 410 – CONSTRUCTION REQUIREMENTS of the MoDOT Standard Specifications, except that asphaltic materials shall not be placed during rainy weather without approval of the Contracting Officer.

DIVISION 2 - SITE WORK

SECTION 02722b

AGGREGATE BASE COURSE

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SECTION 02722b

AGGREGATE BASE COURSE

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 180	(1997) Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and an 457 mm (18-in) Drop
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 29/C 29M	(1997) Bulk Density ("Unit Weight") and Voids in Aggregates
ASTM C 88	(1999a) Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C 127	(1988; R 1993el) Specific Gravity and Absorption of Course Aggregate
ASTM C 128	(1997) Specific Gravity and Absorption of Fine Aggregate
ASTM C 131	(1996) Resistance to Degradation of Small- Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1556	(1990; R 1996el) Density and Unit Weight of Soil in Place by the Sand-Cone Method

ASTM D 1557	(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/cu. ft. (2,700 kN-m/cu.m.))
ASTM D 2167	(1994) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2922	(1996el) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 3017	(1988; R 1996el) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

1.2 DEFINITIONS

For the purposes of this specification, the following definitions apply.

1.2.1 Aggregate Base Course

Aggregate base course (ABC) is well graded, durable aggregate uniformly moistened and mechanically stabilized by compaction.

1.2.2 Degree of Compaction

Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

1.3 UNIT PRICES

1.3.1 Measurement

1.3.1.1 Volume

The quantity of ABC completed and accepted, as determined by the Contracting Officer, will be measured in cubic yards. The volume of material in-place and accepted will be determined by the average job thickness obtained in accordance with paragraph THICKNESS CONTROL and the dimensions shown.

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-01 Data

Plant, Equipment, and Tools; FIO

List of proposed equipment to be used in performance of construction work, including descriptive data.

Waybills and Delivery Tickets; FIO

Copies of waybills and delivery tickets during the progress of the work. Before the final statement is allowed, the Contractor shall file certified waybills and certified delivery tickets for all aggregates actually used.

SD-09 Reports

Sampling and testing; FIO
Field Density Tests; FIO

Calibration curves and related test results prior to using the device or equipment being calibrated. Copies of field test results within 24 hours after the tests are performed. Certified copies of test results for approval not less than 30 days before material is required for the work.

1.5 SAMPLING AND TESTING

Sampling and testing shall be the responsibility of the Contractor. Sampling and testing shall be performed by a testing laboratory approved in accordance with Section 01451b CONTRACTOR QUALITY CONTROL. Work requiring testing will not be permitted until the testing laboratory has been inspected and approved. The materials shall be tested to establish compliance with the specified requirements; testing shall be performed at the specified frequency. The Contracting Officer may specify the time and location of the tests. Copies of test results shall be furnished to the Contracting Officer within 24 hours of completion of the tests.

1.5.1 Sampling

Samples for laboratory testing shall be taken in conformance with ASTM D 75. When deemed necessary, the sampling will be observed by the Contracting Officer.

1.5.2 Tests

The following tests shall be performed in conformance with the applicable standards listed.

1.5.2.1 Sieve Analysis

Sieve analysis shall be made in conformance with ASTM C 117 and ASTM C 136. Sieves shall conform to ASTM E 11.

1.5.2.2 Liquid Limit and Plasticity Index

Liquid limit and plasticity index shall be determined in accordance with ASTM D 4318.

1.5.2.3 Moisture-Density Determinations

The maximum density and optimum moisture content shall be determined in accordance with ASTM D 1557.

1.5.2.4 Field Density Tests

Density shall be field measured in accordance with ASTM D 1556 and ASTM D 2922. For the method presented in ASTM D 1556 the base plate as shown in the drawing shall be used. For the method presented in ASTM D 2922 the calibration curves shall be checked and adjusted if necessary using only the sand cone method as described in paragraph Calibration, of the ASTM publication. Tests performed in accordance with ASTM D 2922 result in a wet unit weight of soil and when using this method, ASTM D 3017 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 3017. The calibration checks of both the density and moisture gauges shall be made by the prepared containers of material method, as described in paragraph Calibration of ASTM D 2922, on each different type of material being tested at the beginning of a job and at intervals as directed.

1.5.2.5 Wear Test

Wear tests shall be made on ABC course material in conformance with ASTM C 131.

1.5.2.6 Soundness

Soundness tests shall be made on GCA in accordance with ASTM C 88.

1.5.3 Testing Frequency

1.5.3.1 Initial Tests

One of each of the following tests shall be performed on the proposed material prior to commencing construction to demonstrate that the proposed material meets all specified requirements when furnished. If materials from more than one source are going to be utilized, this testing shall be completed for each source.

- a. Sieve Analysis including No. 635 size material.
- b. Liquid limit and plasticity index moisture-density relationship.
- c. Moisture-density relationship.
- d. Wear.
- e. Soundness.
- f. Weight per cubic foot of Slag.

1.5.3.2 In Place Tests

One of each of the following tests shall be performed on samples taken from the placed and compacted ABC. Samples shall be taken and tested at the rates indicated.

a. Density tests shall be performed on every lift of material placed and at a frequency of one set of tests for every 250 square yards, or portion thereof, of completed area.

b. Sieve Analysis including No. 635 size material shall be performed for every 500 tons, or portion thereof, of material placed.

c. Liquid limit and plasticity index tests shall be performed at the same frequency as the sieve analysis.

1.5.4 Approval of Material

The source of the material shall be selected 30 days prior to the time the material will be required in the work. Tentative approval of material will be based on initial test results. Final approval of the materials will be based on sieve analysis, liquid limit, and plasticity index tests performed on samples taken from the completed and fully compacted ABC.

1.6 WEATHER LIMITATIONS

Construction shall be done when the atmospheric temperature is above 35 degrees F. When the temperature falls below 35 degrees F, the Contractor shall protect all completed areas by approved methods against detrimental effects of freezing. Completed areas damaged by freezing, rainfall, or other weather conditions shall be corrected to meet specified requirements.

1.7 PLANT, EQUIPMENT, AND TOOLS

All plant, equipment, and tools used in the performance of the work will be subject to approval before the work is started and shall be maintained in satisfactory working condition at all times. The equipment shall be adequate and shall have the capability of producing the required compaction, meeting grade controls, thickness control, and smoothness requirements as set forth herein.

2 PRODUCTS

2.1 AGGREGATES

The ABC shall consist of clean, sound, durable particles of crushed stone, crushed slag, crushed gravel, crushed recycled concrete, angular sand, or other approved material. ABC shall be free of lumps of clay, organic matter, and other objectionable materials or coatings. The portion retained on the No. 4 sieve shall be known as coarse aggregate; that portion passing the No. 4 sieve shall be known as fine aggregate.

2.1.1 Coarse Aggregate

Coarse aggregates shall be angular particles of uniform density. When the coarse aggregate is supplied from more than one source, aggregate from each

source shall meet the specified requirements and shall be stockpiled separately.

a. Crushed Gravel: Crushed gravel shall be manufactured by crushing gravels, and shall meet all the requirements specified below.

b. Crushed Stone: Crushed stone shall consist of freshly mined quarry rock, and shall meet all the requirements specified below.

2.1.1.1 Aggregate Base Course

ABC coarse aggregate shall not show more than 50 percent loss when subjected to the Los Angeles abrasion test in accordance with ASTM C 131. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3; an elongated particle is one having a ratio of length to width greater than 3. In the portion retained on each sieve specified, the crushed aggregates shall contain at least 50 percent by weight of crushed pieces having two or more freshly fractured faces with the area of each face being at least equal to 75 percent of the smallest midsectional area of the piece. When two fractures are contiguous, the angle between planes of the fractures must be at least 30 degrees in order to count as two fractured faces. Crushed gravel shall be manufactured from gravel particles 50 percent of which, by weight, are retained on the maximum size sieve listed in TABLE 1.

2.1.2 Fine Aggregate

Fine aggregates shall be angular particles of uniform density. When the fine aggregate is supplied from more than one source, aggregate from each source shall meet the specified requirements.

2.1.2.1 Aggregate Base Course

ABC fine aggregate shall consist of screenings, angular sand, crushed recycled concrete fines, or other finely divided mineral matter processed or naturally combined with the coarse aggregate.

2.1.3 Gradation Requirements

The specified gradation requirements shall apply to the completed base course. The aggregates shall have a maximum size of 1 inch and shall be continuously well graded within the limits specified in TABLE 1. Sieves shall conform to ASTM E 11.

TABLE I. GRADATION OF AGGREGATES

Percentage by Weight Passing Square-Mesh Sieve

Sieve Designation	No. 3
-----	-----
1 inch	100
1/2 inch	40-70
No. 4	20-50
No. 10	15-40
No. 40	5-25
No. 200	0-10

NOTE 1: Particles having diameters less than 0.0008 inch shall not be in excess of 3 percent by weight of the total sample tested.

NOTE 2: The values are based on aggregates of uniform specific gravity. If materials from different sources are used for the coarse and fine aggregates, they shall be tested in accordance with ASTM C 127 and ASTM C 128 to determine their specific gravities. If the specific gravities vary by more than 10 percent, the percentages passing the various sieves shall be corrected as directed by the Contracting Officer.

2.1.4 Liquid Limit and Plasticity Index

Liquid limit and plasticity index requirements shall apply to the completed course and shall also apply to any component that is blended to meet the required gradation. The portion of any component or of the completed course passing the No. 40 sieve shall be either nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

3 EXECUTION

3.1 GENERAL REQUIREMENTS

When the ABC is constructed in more than one layer, the previously constructed layer shall be cleaned of loose and foreign matter by sweeping with power sweepers or power brooms, except that hand brooms may be used in areas where power cleaning is not practicable. Adequate drainage shall be provided during the entire period of construction to prevent water from collecting or standing on the working area. Line and grade stakes shall be provided as necessary for control. Grade stakes shall be in lines parallel to the centerline of the area under construction and suitably spaced for string lining.

3.2 PREPARATION OF UNDERLYING COURSE

Prior to constructing the ABC, the underlying course or subgrade shall be cleaned of all foreign substances. At the time of construction of the ABC, the underlying course shall contain no frozen material. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances. The underlying course shall conform to Section 02300b EARTHWORK. Ruts or soft yielding spots in the underlying courses, areas having inadequate compaction, and deviations of the surface from the

requirements set forth herein shall be corrected by loosening and removing soft or unsatisfactory material and by adding approved material, reshaping to line and grade, and recompact to specified density requirements. For cohesionless underlying courses containing sands or gravels, as defined in ASTM D 2487, the surface shall be stabilized prior to placement of the ABC. Stabilization shall be accomplished by mixing ABC into the underlying course and compacting by approved methods. The stabilized material shall be considered as part of the underlying course and shall meet all requirements of the underlying course. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained by the Contractor in a satisfactory condition until the ABC is placed.

3.3 INSTALLATION

3.3.1 Mixing the Materials

The coarse and fine aggregates shall be mixed in a stationary plant, or in a traveling plant or bucket loader on an approved paved working area. The Contractor shall make adjustments in mixing procedures or in equipment as directed to obtain true grades, to minimize segregation or degradation, to obtain the required water content, and to insure a satisfactory ABC meeting all requirements of this specification.

3.3.2 Placing

The mixed material shall be placed on the prepared subgrade or subbase in layers of uniform thickness with an approved spreader. When a compacted layer 6 inches or less in thickness is required, the material shall be placed in a single layer. When a compacted layer in excess of 6 inches is required, the material shall be placed in layers of equal thickness. No layer shall exceed 6 inches or less than 3 inches when compacted. The layers shall be so placed that when compacted they will be true to the grades or levels required with the least possible surface disturbance. Where the ABC is placed in more than one layer, the previously constructed layers shall be cleaned of loose and foreign matter by sweeping with power sweepers, power brooms, or hand brooms, as directed. Such adjustments in placing procedures or equipment shall be made as may be directed to obtain true grades, to minimize segregation and degradation, to adjust the water content, and to insure an acceptable ABC.

3.3.3 Grade Control

The finished and completed ABC shall conform to the lines, grades, and cross sections shown. Underlying material(s) shall be excavated and prepared at sufficient depth for the required ABC thickness so that the finished ABC with the subsequent surface course will meet the designated grades.

3.3.4 Edges of Base Course

The ABC shall be placed so that the completed section will be a minimum of 5 feet wider, on all sides, than the next layer that will be placed above it. Additionally, approved fill material shall be placed along the outer edges of ABC in sufficient quantities to compact to the thickness of the course being constructed, or to the thickness of each layer in a multiple layer course, allowing in each operation at least a 2 foot width of this material to be rolled and compacted simultaneously with rolling and compacting of each layer of ABC. If this base course material is to be placed adjacent to

another pavement section, then the layers for both of these sections shall be placed and compacted along this edge at the same time.

3.3.5 Compaction

Each layer of the ABC shall be compacted to 100 percent laboratory maximum density with approved compaction equipment. Water content shall be maintained during the compaction procedure to within plus or minus 3 percent of the optimum water content determined from laboratory tests as specified in paragraph SAMPLING AND TESTING. Rolling shall begin at the outside edge of the surface and proceed to the center, overlapping on successive trips at least one-half the width of the roller. Alternate trips of the roller shall be slightly different lengths. Speed of the roller shall be such that displacement of the aggregate does not occur. In all places not accessible to the rollers, the mixture shall be compacted with hand-operated power tampers. Compaction shall continue until each layer has a degree of compaction that is at least 95 percent of laboratory maximum density through the full depth of the layer. The Contractor shall make such adjustments in compacting or finishing procedures as may be directed to obtain true grades, to minimize segregation and degradation, to reduce or increase water content, and to ensure a satisfactory ABC. Any materials that are found to be unsatisfactory shall be removed and replaced with satisfactory material or reworked, as directed, to meet the requirements of this specification.

3.3.6 Thickness

Compacted thickness of the aggregate course shall be as indicated. No individual layer shall exceed 8 inches nor be less than 3 inches in compacted thickness. The total compacted thickness of the ABC course shall be within 1/2 inch of the thickness indicated. Where the measured thickness is more than 1/2 inch deficient, such areas shall be corrected by scarifying, adding new material of proper gradation, reblading, and recompacting as directed. Where the measured thickness is more than 1/2 inch thicker than indicated, the course shall be considered as conforming to the specified thickness requirements. Average job thickness shall be the average of all thickness measurements taken for the job, but shall be within 1/4 inch of the thickness indicated. The total thickness of the ABC course shall be measured at intervals in such a manner as to ensure one measurement for each 500 square yards of base course. Measurements shall be made in 3 inch diameter test holes penetrating the base course.

3.3.7 Finishing

The surface of the top layer of ABC shall be finished after final compaction by cutting any overbuild to grade and rolling with a steel-wheeled roller. Thin layers of material shall not be added to the top layer of base course to meet grade. If the elevation of the top layer of ABC is 1/2 inch or more below grade, then the top layer should be scarified to a depth of at least 3 inches and new material shall be blended in and compacted to bring to grade. Adjustments to rolling and finishing procedures shall be made as directed to minimize segregation and degradation, obtain grades, maintain moisture content, and insure an acceptable base course. Should the surface become rough, corrugated, uneven in texture, or traffic marked prior to completion, the unsatisfactory portion shall be scarified, reworked and recompacted or it shall be replaced as directed.

3.3.8 Smoothness

The surface of the top layer shall show no deviations in excess of 3/8 inch when tested with a 10 foot straightedge. Measurements shall be taken in successive positions parallel to the centerline of the area to be paved. Measurements shall also be taken perpendicular to the centerline at 50 foot intervals. Deviations exceeding this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and compacting it to meet these specifications.

3.4 TRAFFIC

Completed portions of the ABC course may be opened to limited traffic, provided there is no marring or distorting of the surface by the traffic. Heavy equipment shall not be permitted except when necessary to construction, and then the area shall be protected against marring or damage to the completed work.

3.5 MAINTENANCE

The ABC shall be maintained in a satisfactory condition until the full pavement section is completed and accepted. Maintenance shall include immediate repairs to any defects and shall be repeated as often as necessary to keep the area intact. Any ABC that is not paved over prior to the onset of winter, shall be retested to verify that it still complies with the requirements of this specification. Any area of ABC that is damaged shall be reworked or replaced as necessary to comply with this specification.

3.6 DISPOSAL OF UNSATISFACTORY MATERIALS

Any unsuitable materials that must be removed shall be removed from site. No additional payments will be made for materials that must be replaced.

DIVISION 2 - SITE WORK

SECTION 02754b

CONCRETE PAVEMENT

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SECTION 02754b

CONCRETE PAVEMENTS

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 301	(1996) Standard Specification for Structural Concrete
ACI 305R	(1991) Hot Weather Concreting

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 184/A 184M	(1996) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A 615/A 615M	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 31/C 31M	(1996) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1997) Concrete Aggregates
ASTM C 39	(1996) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 94	(1997) Ready-Mixed Concrete
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1997) Portland Cement
ASTM C 192/C 192M	(1995) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1997) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1995) Air-Entraining Admixtures for Concrete

ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 618	(1997) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 666	(1992) Resistance of Concrete to Rapid Freezing and Thawing
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 989	(1997) Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
ASTM C 1077	(1997) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM D 1751	(1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ARMY CORPS OF ENGINEERS (COE)

COE CRD-C 130	(1989) Scratch Hardness of Coarse Aggregate Particles
COE CRD-C 300	(1990) Specifications for Membrane-Forming Compounds for Curing Concrete
COE CRD-C 540	(1971; R 1981) Standard Specification for Nonbituminous Inserts for Contraction Joints in Portland Cement Concrete Airfield Pavements, Sawable Type
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1996) Concrete Plant Standards
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1.2 SYSTEM DESCRIPTION

This section is intended to stand alone for construction of concrete (rigid) pavement. However, where the construction covered herein interfaces with other sections, the construction at each interface shall conform to the requirements of both this section and the other section, including tolerances for both.

1.3 ACCEPTABILITY OF WORK

The pavement will be accepted on the basis of tests made by the Government and by the Contractor or its suppliers, as specified herein. The Government may, at its discretion, make check tests to validate the results of the

Contractor's testing. Concrete samples shall be taken by the Contractor at the placement to determine the slump, air content, and strength of the concrete. Test cylinders shall be made for determining conformance with the strength requirements of these specifications and, when required, for determining the time at which pavements may be placed into service. All air content measurements shall be determined in accordance with ASTM C 231. All slump tests shall be made in accordance with ASTM C 143. All test cylinders shall be 6 by 12 inch cylinders and shall be fabricated in accordance with ASTM C 192/C 192M, using only steel molds, cured in accordance with ASTM C 31/C 31M, and tested in accordance with ASTM C 39. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. The Contractor shall furnish all materials, labor, and facilities required for molding, curing, testing, and protecting test specimens at the site and in the laboratory.

1.3.1 Evaluation Sampling

Sampling, testing, and mixture proportioning shall be performed by a commercial Testing Laboratory, conforming with ASTM C 1077. The individuals who sample and test concrete and concrete constituents shall be certified as American Concrete Institute (ACI) Concrete Field Testing Technicians, Grade I. The individuals who perform the inspection of concrete shall be certified as ACI Concrete Construction Inspector, Level II. All mix design, daily quality control reports, smoothness reports, and project certification reports shall be signed by a Registered Engineer.

1.3.2 Surface Testing

Surface testing for surface smoothness and plan grade shall be performed as indicated below by the Testing Laboratory. The measurements shall be properly referenced in accordance with paving lane identification and stationing, and a report given to the Government within 24 hours after measurement is made. A final report of surface testing, signed by a Registered Engineer, containing all surface measurements and a description of all actions taken to correct deficiencies, shall be provided to the Government upon conclusion of surface testing.

1.3.2.1 Surface Smoothness Requirements

The finished surfaces of the pavements shall have no abrupt change of 1/8 inch or more, and all pavements shall be within the tolerances specified in Table 1 when checked with the 10 foot straightedge.

TABLE 1
STRAIGHTEDGE SURFACE SMOOTHNESS--PAVEMENTS

Pavement Category -----	Direction of Testing -----	Tolerances inches -----
Roads and Streets	Longitudinal	3/16
	Transverse	1/4
Parking Areas, Walkways	Longitudinal	1/4
	Transverse	1/4

1.3.2.2 Surface Smoothness Testing Method

The surface of the pavement shall be tested with the straightedge to identify all surface irregularities exceeding the tolerances specified above. The entire area of the pavement shall be tested in both a longitudinal and a transverse direction on parallel lines approximately 15 feet apart. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length and measuring the maximum gap between the straightedge and the pavement surface, in the area between these two high points.

1.3.3 Plan Grade Testing and Conformance

The finished surface of the pavements shall conform, within the tolerances shown in Table 1, to the lines, grades, and cross sections shown. The finished surface of new abutting pavements shall coincide at their juncture. The surfaces of other pavements shall vary not more than 0.06 foot above or below the plan grade line or elevation indicated. Each pavement category shall be checked by the Contractor for conformance with plan grade requirements by running lines of levels at intervals to determine the elevation at each joint intersection.

1.4 PRECONSTRUCTION TESTING OF MATERIALS

The Contractor shall not be entitled to any additional payment or extension of time because of delays caused by sampling and testing additional sources, or samples, necessitated by failure of any samples. Aggregates shall be sampled and tested by the Test Laboratory and shall be representative of the materials to be used for the project. Test results, signed by a Registered Engineer, shall be submitted 45 days before commencing paving. No aggregate shall be used unless test results show that it meets all requirements of these specifications, including compliance with ASTM C 33 and deleterious materials limitations.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-01 Data

Equipment; FIO

Manufacturer's literature on the concrete plant; mixing equipment; hauling equipment; placing and finishing, and curing equipment; at least 7 days prior to start of paving.

Paving; FIO

Paving Schedules at least 7 days prior to start of paving.

Mixture Proportions; FIO,

The report of the Contractor's mixture proportioning studies showing the proportions of all ingredients and supporting information on aggregate and other materials that will be used in the manufacture of concrete, at least 14 days prior to commencing concrete placing operations.

1.6 EQUIPMENT

1.6.1 Batching and Mixing

The batching plant shall conform to NRMCA CPMB 100, the equipment requirements in ASTM C 94, and as specified. Water shall not be weighed or measured cumulatively with another ingredient. All concrete materials batching shall meet ASTM C 94 requirements. Mixers shall be stationary mixers. Truck mixers shall not be used for mixing paving concrete. Batching, mixers, mixing time, permitted reduction of mixing time, and concrete uniformity shall meet the requirements of ASTM C 94, and shall be documented in the initial daily QC Report.

1.6.2 Transporting Equipment

Transporting equipment shall be in conformance with ASTM C 94 and as specified herein. Concrete shall be transported to the paving site drum agitator transit trucks. Bottom-dump trucks shall not be used for delivery of concrete.

1.6.3 Delivery Equipment

When concrete transport equipment cannot operate on the paving lane, side-delivery transport equipment consisting of self-propelled moving conveyors shall be used to deliver concrete from the transport equipment and discharge it in front of the paver. Front-end loaders, dozers, or similar equipment shall not be used to distribute the concrete.

1.6.4 Paver-Finisher

The paver-finisher shall be a heavy-duty, self-propelled machine designed specifically for paving and finishing high quality pavement. The paver-finisher shall weigh at least 2200 lb./foot of lane width, and shall be powered by an engine having at least 6.0 horsepower per foot of lane width. The paver-finisher shall spread, consolidate, and shape the plastic concrete to the desired cross section in one pass. The paver-finisher shall be equipped with a full width "knock-down" auger, capable of operating in both directions, which will evenly spread the fresh concrete in front of the screed or extrusion plate. Immersion vibrators shall be gang mounted at the front of the paver on a frame equipped with suitable controls so that all vibrators can be operated at any desired depth within the slab or completely withdrawn from the concrete. The vibrators shall be automatically controlled so that they will be immediately stopped as forward motion of the paver ceases. The spacing of the immersion vibrators across the paving lane shall be as necessary to properly consolidate the concrete, but the clear distance between vibrators shall not exceed 30 inches, and the outside vibrators shall not exceed 12 inches from the edge of the lane. The paver-finisher shall be equipped with a transversely oscillating screed or an extrusion plate to shape, compact, and smooth the surface.

1.6.4.1 Paver-Finisher with Fixed Forms

The paver-finisher shall be equipped with wheels designed to ride the forms, keep it aligned with the forms, and to spread the preventing deformation of the forms.

1.6.4.2 Slipform Paver-Finisher

The slipform paver-finisher shall be automatically controlled and crawler mounted with padded tracks. Horizontal alignment shall be electronically referenced to a taut wire guideline. Vertical alignment shall be electronically referenced on both sides of the paver to a taut wire guideline, to an approved laser control system, or to a ski operating on a completed lane. Control from a slope-adjustment control or control operating from the underlying material shall not be used.

1.6.5 Curing Equipment

Equipment for curing is specified in paragraph CURING.

1.6.6 Texturing Equipment

Texturing equipment shall be as specified below.

1.6.6.1 Fabric Drag

A fabric drag shall consist of a piece of fabric material as wide as the lane width securely attached to a separate wheel mounted frame spanning the paving lane or to one of the other similar pieces of equipment. The material shall be wide enough to provide 12 to 18 inches dragging flat on the pavement surface. The fabric material shall be clean, reasonably new burlap, kept clean and saturated during use.

1.6.7 Sawing Equipment

Equipment for sawing joints and for other similar sawing of concrete shall be standard diamond-tip-bladed concrete saws mounted on a wheeled chassis.

1.6.8 Straightedge

The Contractor shall furnish and maintain at the job site one 12 foot straightedge for testing concrete surface smoothness. The straightedge shall be constructed of aluminum or magnesium alloy and shall have blades of box or box-girder cross section with flat bottom, adequately reinforced to insure rigidity and accuracy. Straightedges shall have handles for operation on the pavement.

2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

2.1.1 SEE SECTION 03300b FOR CONCRETE REQUIREMENTS

2.2 REINFORCING

2.2.1 General

Reinforcing bars shall conform to ASTM A 615/A 615M Grade 60. Bar mats shall conform to ASTM A 184/A 184M. Reinforcement shall be free from loose, flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce the bond with concrete.

2.3 DOWELS AND TIE BARS

2.3.1 Dowels

Dowels shall be single piece, plain (non-deformed) steel bars conforming to ASTM A 615/A 615M Grade 60 or higher. Dowels shall be free of loose, flaky rust and loose scale and shall be clean and straight.

2.3.2 Tie Bars

Tie bars shall be deformed steel bars conforming to ASTM A 615/A 615M Grade 60. Grade 60 or higher shall not be used for bars that are bent and straightened during construction.

2.4 EPOXY RESIN

All epoxy-resin materials shall be two-component materials conforming to ASTM C 881, Class as appropriate for each application temperature to be encountered; except, that in addition, the materials shall meet the following requirements:

- a. Material for use for embedding dowels and anchor bolts shall be Type IV, Grade 3.
- b. Material for use as patching for complete filling of spalls, wide cracks, and other voids and for use in preparing epoxy resin mortar shall be Type III, Grade as approved.
- c. Material for injecting cracks shall be Type IV, Grade 1.
- d. Material for bonding freshly mixed portland cement concrete, mortar, or freshly mixed epoxy resin concrete to hardened concrete shall be Type V, Grade as approved.

2.5 SPECIFIED CONCRETE STRENGTH AND OTHER PROPERTIES

2.5.1 SEE SECTION 03300b

3 EXECUTION

3.1 CONDITIONING OF UNDERLYING MATERIAL

Underlying material, subgrade, base course, upon which concrete is to be placed shall be clean, damp, and free from debris, waste concrete or cement, frost, ice, and standing or running water. After the underlying material has been prepared for concrete placement, no equipment shall be permitted thereon.

3.2 WEATHER LIMITATIONS

3.2.1 Hot Weather Paving

The temperature of concrete shall not exceed 90 degrees F. Steel forms, dowels and reinforcing shall be cooled prior to concrete placement when steel temperatures are greater than 120 degrees F.

3.2.2 Cold Weather Paving

The ambient temperature of the air at the placing site and the temperature of surfaces to receive concrete shall be not less 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Calcium chloride shall not be used at any time. Covering and other means shall be provided for maintaining the concrete at a temperature of at least 50 degrees F for not less than 72 hours after placing, and at a temperature above freezing for the remainder of the curing period. Pavement damaged by freezing shall be completely removed and replaced at the Contractor's expense as specified in paragraph, REPAIR, REMOVAL, AND REPLACEMENT OF SLABS.

3.3 CONCRETE PRODUCTION

3.3.1 General Requirements

Concrete shall be deposited in front of the paver within 45 minutes from the time cement has been charged into the mixing drum, except that if the ambient temperature is above 90 degrees F, the time shall be reduced to 30 minutes. Every load of concrete delivered to the paving site shall be accompanied by a batch ticket from the operator of the batching plant. Tickets shall show at least the mass, or volume, of all ingredients in each batch delivered, [the water meter and revolution meter reading on truck mixers] and the time of day. Tickets shall be delivered to the placing foreman who shall keep them on file and deliver them to the Government daily.

3.3.2 Transporting and Transfer-Spreading Operations

Non-agitating equipment shall be used only on smooth roads and for haul time less than 15 minutes. Equipment shall be allowed to operate on the underlying material only if no damage is done to the underlying material and its degree of compaction. Any disturbance to the underlying material that does occur shall be corrected before the paver-finisher reaches the location of the disturbance and the equipment shall be replaced or procedures changed to prevent any future damage.

3.4 PAVING

Pavement shall be constructed with paving and finishing equipment utilizing slipform or fixed forms.

3.4.1 Consolidation

The paver vibrators shall be inserted into the concrete not closer to the underlying material than 2 inches. The vibrators or any tamping units in front of the paver shall be automatically controlled so that they shall be stopped immediately as forward motion ceases. Excessive vibration shall not be permitted. Concrete in small, odd-shaped slabs or in locations inaccessible to the paver mounted vibration equipment shall be vibrated with a hand-operated immersion vibrator. Vibrators shall not be used to transport or spread the concrete.

3.4.2 Operation

When the paver is operated between or adjacent to previously constructed pavement (fill-in lanes), provisions shall be made to prevent damage to the previously constructed pavement, including keeping the existing pavement surface free of any debris, and placing rubber mats beneath the paver tracks. Transversely oscillating screeds and extrusion plates shall overlap the existing pavement the minimum possible, but in no case more than 8 inches.

3.4.3 Required Results

The paver-finisher shall be operated to produce a thoroughly consolidated slab throughout, true to line and grade within specified tolerances. The paver-finishing operation shall produce a surface finish free of irregularities, tears, voids of any kind, and any other discontinuities. It shall produce only a very minimum of paste at the surface. Multiple passes of the paver-finisher shall not be permitted. The equipment and its operation shall produce a finished surface requiring no hand finishing, other than the use of cutting straightedges, except in very infrequent instances. No water, other than true fog sprays (mist), shall be applied to the concrete surface during paving and finishing.

3.4.4 Fixed Form Paving

Forms shall be steel, except that wood forms may be used for curves having a radius of 150 feet or less, and for fillets. Forms may be built up with metal or wood, added only to the base, to provide an increase in depth of not more than 25 percent. The base width of the form shall be not less than eight-tenths of the vertical height of the form, except that forms 8 inches or less in vertical height shall have a base width not less than the vertical height of the form. Wood forms for curves and fillets shall be adequate in strength and rigidly braced. Forms shall be set on firm material cut true to grade so that each form section when placed will be firmly in contact with the underlying layer for its entire base. Forms shall not be set on blocks or on built-up spots of underlying material. Forms shall remain in place at least 12 hours after the concrete has been placed. Forms shall be removed without injuring the concrete.

3.4.5 Slipform Paving

The slipform paver shall shape the concrete to the specified and indicated cross section in one pass, and shall finish the surface and edges so that only a very minimum amount of hand finishing is required. Dowels shall not be installed by dowel inserters attached to the paver or by any other means of inserting the dowels into the plastic concrete. If a keyway is required,

a 26 gauge thick metal keyway liner shall be installed as the keyway is extruded. The keyway liner shall be protected and shall remain in place and become part of the joint.

3.4.6 Placing Reinforcing Steel

Reinforcement shall be positioned on suitable chairs securely fastened to the subgrade prior to concrete placement.

3.4.7 Placing Dowels and Tie Bars

Dowels shall be installed with alignment not greater than 1/8 inch per ft. Except as otherwise specified below, location of dowels shall be within a horizontal tolerance of plus or minus 5/8 inch and a vertical tolerance of plus or minus 3/16 inch. The portion of each dowel intended to move within the concrete or expansion cap shall be painted with one coat of rust inhibiting primer paint, and then coated with heavy grease just prior to placement. Dowels and tie bars in joints shall be omitted when the center of the dowel or tie bar is located within a horizontal distance from an intersecting joint equal to or less than one-fourth of the slab thickness.

3.4.7.1 Contraction Joints

Dowels and tie bars in longitudinal and transverse contraction joints within the paving lane shall be held securely in place by means of rigid metal basket assemblies. The dowels and tie bars shall be welded to the assembly or held firmly by mechanical locking arrangements that will prevent them from becoming distorted during paving operations. The basket assemblies shall be held securely in the proper location by means of suitable anchors.

3.4.7.2 Construction Joints-Fixed Form Paving

Installation of dowels and tie bars shall be by the bonded-in-place method, supported by means of devices fastened to the forms. Installation by removing and replacing in preformed holes will not be permitted.

3.4.7.3 Dowels Installed in Hardened Concrete

Installation shall be by bonding the dowels into holes drilled into the hardened concrete. Holes approximately 1/8 inch greater in diameter than the dowels shall be drilled into the hardened concrete. Dowels shall be bonded in the drilled holes using epoxy resin injected at the back of the hole before installing the dowel and extruded to the collar during insertion of the dowel so as to completely fill the void around the dowel. Application by buttering the dowel shall not be permitted. The dowels shall be held in alignment at the collar of the hole, after insertion and before the grout hardens, by means of a suitable metal or plastic collar fitted around the dowel. The vertical alignment of the dowels shall be checked by placing the straightedge on the surface of the pavement over the top of the dowel and measuring the vertical distance between the straightedge and the beginning and ending point of the exposed part of the dowel. Where tie bars are required in longitudinal construction joints of slipform pavement, bent tie bars shall be installed at the paver, in front of the transverse screed or extrusion plate. If tie bars are required, a standard keyway shall be constructed, and the bent tie bars shall be inserted into the plastic concrete through a 26 gauge thick metal keyway liner. Tie bars shall not be installed in preformed holes. The keyway liner shall be protected and shall

remain in place and become part of the joint. Before placement of the adjoining paving lane, the tie bars shall be straightened, without spalling the concrete around the bar.

3.4.7.4 Expansion Joints

Dowels in expansion joints shall be installed by the bonded-in-place method.

3.5 FINISHING

Clary screeds, "bridge deck" finishers, or other rotating pipe or tube type equipment shall not be permitted. The sequence of machine operations shall be transverse finishing, longitudinal machine floating if used, straightedge finishing, texturing, and then edging of joints. Hand finishing shall be used only infrequently and only on isolated areas of odd slab shapes and in the event of a breakdown of the mechanical finishing equipment. Supplemental hand finishing for machine finished pavement shall be kept to an absolute minimum. Equipment to be used for supplemental hand finishing shall primarily be 10 to 12 feet cutting straightedges; only very sparing use of bull floats shall be allowed. At no time shall water be added to the surface of the slab in any way, except for fog (mist) sprays to prevent plastic shrinkage cracking.

3.5.1 Machine Finishing With Fixed Forms

The machine shall be designed to ride the forms. Machines that cause displacement of the forms shall be replaced. The machine shall make only one pass over each area of pavement. If the equipment and procedures do not produce a surface of uniform texture, true to grade, in one pass, the operation shall be immediately stopped and the equipment, mixture, and procedures adjusted as necessary.

3.5.2 Machine Finishing With Slipform Pavers

If there is sufficient concrete slurry or fluid paste on the surface that it runs over the edge of the pavement, the paving operation shall be immediately stopped and the equipment, mixture, or operation modified to prevent formation of such slurry. Any slurry which does run down the vertical edges shall be immediately removed. No slurry, concrete or concrete mortar shall be used to build up along the edges of the pavement to compensate for excessive edge slump, either while the concrete is plastic or after it hardens.

3.5.3 Surface Correction

While the concrete is still plastic, irregularities and marks in the pavement surface shall be eliminated by means of cutting straightedges, 10 to 12 feet in length. Depressions shall be filled with freshly mixed concrete, struck off, consolidated, and refinished. Projections above the required elevation shall also be struck off and refinished. Long-handled, flat "bull floats" shall be used sparingly and only as necessary to correct minor, scattered surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Joints and edges shall not be overfinished.

3.5.4 Hand Finishing

Hand finishing operations shall be used only for those unusual slabs as specified previously. Grate tampers (jitterbugs) shall not be used. As soon as placed and vibrated, the concrete shall be struck off and screeded. The surface shall be tamped with a strike-off and tamping screed, or vibratory screed. Immediately following the final tamping of the surface, the pavement shall be floated longitudinally. Long-handled, flat bull floats shall be used sparingly and only as necessary to correct surface defects. Finishing with hand floats and trowels shall be held to the absolute minimum necessary. Joints and edges shall not be overfinished. No water shall be added to the pavement during finishing operations.

3.5.5 Texturing

Before the surface sheen has disappeared and before the concrete hardens, the surface of the pavement shall be given a texture as described herein. Following initial texturing on the first day of placement, the Placing Foreman, Contracting Officer representative, and a representative of the Using Agency shall inspect the texturing for compliance with design requirements. After curing is complete, all textured surfaces shall be thoroughly power broomed to remove all debris. Any type of transverse texturing shall produce grooves in straight lines across each lane within a tolerance of plus or minus 1/2 inch of a true line. The concrete in areas of recesses for tie-down anchors, lighting fixtures, and other outlets in the pavement shall be finished to provide a surface of the same texture as the surrounding area.

3.5.5.1 Fabric-Drag Surface Finish

Surface texture shall be applied by dragging the surface of the pavement, in the direction of the concrete placement, with a moist fabric drag. The dragging shall produce a uniform finished surface having a fine sandy texture without disfiguring marks.

3.5.5.2 Surface Grooving

The areas indicated on the drawings shall be grooved with a spring tine drag producing individual grooves 1/4 inch deep and 1/4 inch wide at a spacing between groove centerlines of 2 inches. These grooves shall be cut perpendicular to the centerline. Before grooving begins, the concrete shall be allowed to stiffen sufficiently to prevent dislodging of aggregate. Grooves shall not be cut within 6 inches of a transverse joint or crack.

3.5.6 Edging

The edges of slipformed lanes shall not be edged. After texturing has been completed, the edge of the slabs along the forms shall be carefully finished with an edging tool to form a smooth rounded surface of 1/8 inch radius. No water shall be added to the surface during edging.

3.6 CURING

Concrete shall be continuously protected against loss of moisture and rapid temperature changes for at least 7 days from the completion of finishing operations. Unhardened concrete shall be protected from rain and flowing

water. During hot weather with low humidity and/or wind, the Contractor shall institute measures to prevent plastic shrinkage cracks from developing. ACI 305R contains means of predicting plastic shrinkage cracking and preventative measures. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry. Curing shall be accomplished by one of the following methods.

3.6.1 Membrane Curing

A uniform coating of white-pigmented membrane-forming curing compound shall be applied to the entire exposed surface of the concrete including pavement edges as soon as the free water has disappeared from the surface after finishing. If evaporation is high and no moisture is present on the surface even though bleeding has not stopped, fog sprays shall be used to keep the surface moist until setting of the cement occurs. Curing compound shall then be immediately applied. Curing compound shall be applied to the finished surfaces by means of a self-propelled automatic spraying machine, equipped with multiple spraying nozzles with wind shields, spanning the newly paved lane. The curing compound shall be applied at a maximum application rate of 200 square feet per gallon. The application of curing compound by hand-operated, mechanical powered pressure sprayers will be permitted only on odd widths or shapes of slabs where indicated and on concrete surfaces exposed by the removal of forms. The compound shall form a uniform, continuous, cohesive film that will not check, crack, or peel and that will be free from pinholes and other discontinuities. Areas where the curing compound develops the above defects or is damaged by heavy rainfall, sawing or other construction operations within the curing period, shall be immediately resprayed.

3.6.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Impervious sheet curing shall not be used.

3.7 JOINTS

No deviation from the jointing pattern shown on the drawings shall be made without written approval of the Contracting Officer. All joints shall be straight, perpendicular to the finished grade of the pavement, and continuous from edge to edge or end to end of the pavement with no abrupt offset and no gradual deviation greater than 1/2 inch.

3.7.1 Longitudinal Construction Joints

Dowels shall be installed in the longitudinal construction joints, or the edges shall be thickened as indicated. The dimensions of the keyway shall not vary more than plus or minus 1/8 inch from the dimensions indicated and shall not deviate more than plus or minus 1/4 inch from the mid-depth of the pavement. If any length of completed keyway of 5 feet or more fails to meet the above tolerances, dowels shall be installed.

3.7.2 Transverse Construction Joints

Transverse construction joints shall be installed at a planned contraction joint, at the end of each day's placing operations and when concrete placement is interrupted. Transverse construction joints shall be constructed either by utilizing headers and hand placement and finishing techniques, or by placing concrete beyond the transverse construction joint location and then saw cutting full depth and removing concrete back to the transverse construction joint location. For the latter case, dowels shall be installed using methods for dowels installed in hardened concrete described above. All transverse construction joints shall be dowelled.

3.7.3 Expansion Joints

Expansion joints shall be formed where indicated, and about any structures and features that project through or into the pavement, using preformed joint filler of the type, thickness, and width indicated, and shall extend the full slab depth. Edges of the concrete at the joint face shall be edged. The joint filler strips shall be installed to form a recess at the pavement surface to be filled with joint sealant. Expansion joints shall be constructed with dowels for load transfer.

3.7.4 Contraction Joints

Transverse and longitudinal contraction joints shall be of the weakened-plane or dummy type. Longitudinal contraction joints shall be constructed by sawing a groove in the hardened concrete with a power-driven saw. Transverse contraction joints shall be constructed in conformance with requirements for sawed joints.

3.7.4.1 Sawed Joints

Sawed contraction joints shall be constructed by sawing a groove in the concrete with a 1/8 inch blade to the indicated depth. The time of initial sawing shall vary depending on existing and anticipated weather conditions and shall be such as to prevent uncontrolled cracking of the pavement. Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit cutting the concrete without chipping, spalling, or tearing. The joints shall be sawed at the required spacing consecutively in the sequence of the concrete placement. Sawing at a given joint location shall be discontinued when a crack develops ahead of the saw cut. Immediately after the joint is sawed, the saw cut and adjacent concrete surface shall be thoroughly flushed with water until all waste from sawing is removed from the joint. The surface shall be resprayed with curing compound as soon as free water disappears. The top of the joint opening and the joint groove at exposed edges shall be tightly sealed with cord or backer rod before the concrete in the region of the joint is resprayed with curing compound.

3.7.5 Thickened Edge Joints

Underlying material in the transition area shall meet the requirements for smoothness and compaction specified for all other areas of the underlying material.

3.8 REPAIR, REMOVAL, AND REPLACEMENT OF SLABS

New pavement slabs that contain full-depth cracks shall be removed and replaced, as specified herein at no cost to the Government. Removal and replacement shall be full depth, shall be full width of the paving lane, and the limit of removal shall be from each original transverse joint. The Contracting Officer will determine whether cracks extend full depth of the pavement and may require minimum 6 inch diameter cores to be drilled on the crack to determine depth of cracking. Cores shall be drilled and the hole later filled by the Contractor with a well consolidated concrete mixture bonded to the walls of the hole with epoxy resin. Drilling of cores and refilling holes shall be at no expense to the Government. Cracks that do not extend full depth of slab shall be cleaned and then pressure injected with epoxy resin, Type IV, Grade 1. The Contractor shall ensure that the crack is not widened during epoxy resin injection. Where a full depth crack intersects the original transverse joint, the slab(s) containing the crack shall be removed and replaced, with dowels installed, as required below. Spalls along joints shall be repaired as specified.

3.8.1 Removal and Replacement of Full Slabs

Unless there are keys or dowels present, all edges of the slab shall be sawcut full depth. If keys, dowels, or tie bars are present along any edges, these edges shall be sawed full depth 6 inches from the edge if only keys are present, or just beyond the end of dowels or tie bars if they are present. These joints shall then be carefully sawed on the joint line to within 1 inch of the depth of the dowel or key. The slab to be replaced shall be further divided by sawing full depth, at appropriate locations, and each piece lifted out and removed. The narrow strips along keyed or doweled edges shall be carefully broken up and removed. Care shall be taken to prevent damage to the dowels, tie bars, or keys or to concrete to remain in place. Protruding portions of dowels shall be painted and lightly oiled. The joint face below keys or dowels shall be suitably trimmed so that there is no abrupt offset. If underbreak occurs at any point along any edge, the area shall be hand-filled with concrete, producing an even joint face from top to bottom, before replacing the removed slab. If underbreak over 4 inches deep occurs, the entire slab containing the underbreak shall be removed and replaced. Where there are no dowels, tie bars, or keys on an edge, or where they have been damaged, dowels of the size and spacing as specified for other joints in similar pavement shall be installed by epoxy grouting them into holes drilled into the existing concrete. Original damaged dowels or tie bars shall be cut off flush with the joint face. All four edges of the new slab shall thus contain dowels or original keys or original tie bars. Prior to placement of new concrete, the underlying material shall be graded and recompact, and the surfaces of all four joint faces shall be cleaned of all loose material and contaminants, and coated with a double application of membrane forming curing compound as bond breaker. Placement of concrete shall be as specified for original construction. The resulting joints around the new slab shall be prepared and sealed as specified.

3.8.2 Repairing Spalls Along Joints

Spalls along joints and cracks shall be repaired by first making a vertical saw cut at least 1 inch outside the spalled area and to a depth of at least 2 inches. Saw cuts shall be straight lines forming rectangular areas. The concrete between the saw cut and the joint, or crack, shall be chipped out

to remove all unsound concrete. The cavity shall be thoroughly cleaned with high pressure water jets supplemented with compressed air to remove all loose material. Immediately before filling the cavity, a prime coat shall be applied to the dry cleaned surface of all sides and bottom of the cavity, except any joint face. The prime coat shall be applied in a thin coating and scrubbed into the surface with a stiff-bristle brush. Prime coat for portland cement repairs shall be a neat cement grout and for epoxy resin repairs shall be epoxy resin, Type III, Grade 1. The cavity shall be filled with low slump portland cement concrete or mortar, or with epoxy resin concrete or mortar. Portland cement concrete shall be used for larger spalls, those more than 1/3 cu. ft. in size after removal operations; portland cement mortar shall be used for spalls between 0.03 and 1/3 cu. ft.; and epoxy resin mortar or Type III, Grade 3 epoxy resin for those spalls less than 0.03 cu. ft. in size after removal operations. Portland cement concretes and mortars shall be very low slump mixtures, proportioned, mixed, placed, tamped, and cured. If the materials and procedures are approved in writing, latex modified concrete mixtures may be used for repairing spalls less than 1/3 cu.ft. in size. Epoxy resin mortars shall be made with Type III, Grade 1, epoxy resin, using proportions, mixing, placing, tamping and curing procedures as recommended by the manufacturer. Any repair material on the surrounding surfaces of the existing concrete shall be removed before it hardens. Where the spalled area abuts a joint, an insert or other bond-breaking medium shall be used to prevent bond at the joint face. A reservoir for the joint sealant shall be sawed to the dimensions required for other joints. In lieu of sawing, spalls not adjacent to joints, and popouts, both less than 6 inches in maximum dimension, may be prepared by drilling a core 2 inches in diameter greater than the size of the defect, centered over the defect, and 2 inches deep or 1/2 inch into sound concrete, whichever is greater. The core hole shall be repaired as specified above for other spalls.

3.8.3 Areas Defective in Plan Grade or Smoothness

In areas not meeting the specified limits for surface smoothness and plan grade, high areas shall be reduced to attain the required smoothness and grade, except as depth is limited below. High areas shall be reduced by grinding the hardened concrete with a surface grinding machine after the concrete is 14 days or more old. The depth of grinding shall not exceed 1/4 inch. All pavement areas requiring plan grade or surface smoothness corrections in excess of the specified limits, shall be removed and replaced. In pavement areas given a wire comb or tined texture, areas exceeding 25 square feet that have been corrected by rubbing or grinding shall be retextured by grooving machine sawn grooves meeting the requirements for the wire comb or tined texture. All areas in which grinding has been performed will be subject to the thickness tolerances specified in paragraph Thickness. Any grinding performed on individual slabs with excessive deficiencies shall be performed at the Contractor's own decision without entitlement to additional compensation if eventual removal of the slab is required.

3.9 EXISTING CONCRETE PAVEMENT REMOVAL AND REPAIR

Existing concrete pavement shall be removed as indicated and as specified in Section 02231b DEMOLITION.

3.10 PAVEMENT PROTECTION

The Contractor shall protect the pavement against all damage prior to final acceptance of the work. Traffic shall be excluded from the new pavement. All new and existing pavement carrying construction traffic or equipment shall be continuously kept completely clean.

3.11 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL (CQC)

Paragraph ACCEPTABILITY OF WORK contains additional CQC requirements. The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and submit reports as specified. When, in the opinion of the Contracting Officer, the paving operation is out of control, concrete placement shall cease.

3.11.1 Batch Plant Control

A daily report shall be prepared indicating checks made for scale accuracy with test weights, checks of batching accuracy, and corrective action taken prior to and during placement for weighing or batching, type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water masses per cubic yd, amount of water as free moisture in each size of aggregate, and the batch aggregate and water masses per cubic yd. for each class of concrete batched during each day's plant operation.

3.11.2 Concrete Mixture

- a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two other tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of paving. Whenever air content reaches specified limits, an immediate confirmatory test shall be made. If the second test also shows air content at or exceeding specified limits, an adjustment shall immediately be made in the amount of air-entraining admixture batched to bring air content within specified limits. If the next adjusted batch of concrete is not within specified limits, concrete placement shall be halted until concrete air content is within specified limits.
- b. Slump Testing. Slump tests shall be made when test specimens are fabricated. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Whenever slump approaches the maximum limit, an adjustment shall immediately be made in the batch masses of water and fine aggregate, without exceeding the maximum w/(c+p). When a slump result exceeds the specification limit, no further concrete shall be delivered to the paving site until adjustments have been made and slump is again within the limit.
- c. Temperature. The temperature of the concrete shall be measured when strength specimens are fabricated.
- d. Concrete Strength Testing. Four (4) cylinders from the same batch shall be fabricated, cured and tested for compressive strength,

testing two cylinders at 7-day and two cylinders at 28-day age. A minimum of one set of four (4) cylinders shall be fabricated, cured and tested for each shift of concrete placement. Control charts for strength, showing the 7-day and 28-day CQC compressive strengths, and the 28-day required compressive strength, shall be maintained and submitted with daily CQC Reports.

3.11.3 Inspection Before Placing

Underlying materials, joint locations and types, construction joint faces, forms, reinforcing, dowels, and embedded items shall be inspected by a Government Quality Assurance Representative in sufficient time prior to each paving operation in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing, and the certification signed by the Registered Engineer, prior to each days' paving.

3.11.4 Curing Inspection

- a. Moist Curing Inspections. Each day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded. When any inspection finds an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for the area shall be extended by 1 day.
- b. Membrane Curing Inspection. At the end of each day's placement, the CQC Representative shall determine the quantity of compound used by measurement of the container; shall determine the area of concrete surface covered; shall then compute the rate of coverage in square feet per gallon and shall also note whether or not coverage is uniform. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

3.11.5 Cold-Weather Protection

At least once per day, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

3.11.6 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A daily report, signed by a Quality Assurance Representative, shall be prepared for the updating of control charts and test data, and all CQC inspections and actions covering the entire period from the start of the construction through the current week. Reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all CQC records. At the completion of concrete placement, a certification report shall be prepared containing mix designs, all updated control charts and concrete test data, quality control reports, smoothness reports, and other pertinent data on the concrete, with a certification by a registered engineer that the concrete placed meets all specification requirements. A copy of the certification report shall be mailed to the Contracting Officer.

DIVISION 2 - SITEWORK

SECTION 02763b

PAVEMENT MARKING

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SECTION 02763b

PAVEMENT MARKING

PART 1 GENERAL

1.1 DESCRIPTION

This item shall consist of furnishing and placing pavement markings of the color and type specified, according to these specifications and in conformity with the dimensions and at the locations shown on the plans or as directed.

1.2 REFERENCES

The publication listed below form a part of this specification to the extent referenced. The publication is referred to in the text by basic designation only.

MISSOURI DEPARTMENT OF TRANSPORTATION DEPARTMENT (MoDOT)

MoDOT Standard Specifications	Missouri Standard Specifications for Highway Construction, Edition of 1999 (Sections 620.3 and 620.4 Measurement and Payment not included)
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1.3 GENERAL REQUIREMENTS

Work under this section shall be in accordance with Section 620 - TRAFFIC MARKING of the MoDOT Standard Specifications, except as modified or augmented herein.

1.4 SUBMITTALS

Submittals having an "FIO" designation are for information only. The Following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES.

SD-01 Data

Reflectorized Paint; FIO

SD-09 Reports

Raised Pavement Marker, FIO

Marker shall be certified for compliance with all specification requirements.

SD-13 Certificates

Reflectorized Paint; FIO

The manufacturer shall furnish a certification for each lot that materials supplied conform to all requirements specified and stating that the material tested for QPL listing.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

DIVISION 2 - SITE WORK

SECTION 02782b

BRICK PAVERS

(WALKWAY AND CROSSWALKS)

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SECTION 02782b

BRICK PAVERS

(WALKWAY AND CROSSWALKS)

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 301	(1999) Standard Specifications for Structural Concrete
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 67	(1999a) Sampling and Testing Brick and Structural Clay Tile
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ASTM C 117	(1995) Materials Finer Than 75 micrometer (No. 200) Sieve in Mineral Aggregates by Washing
------------	--

ASTM C 131	(1996) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
------------	---

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
------------	--

ASTM C 270	(2001) Standard Specification for Mortar for Unit Masonry
------------	---

ASTM C 902	(2001) Pedestrian/Light Traffic Paving Brick
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ASTM C 1272	(2001) Heavy Vehicular Paving Brick
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ASTM D 75	(1987; R 1997) Sampling Aggregates
-----------	------------------------------------

ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils
-------------	---

ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes
-----------	---

TILE CORPORATION OF AMERICA (TCA)

TCA Handbook - Detail F102-98	(1998) Pavers Installed on Concrete Slab
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TCA Handbook -	(1998) Expansion Joints and Control Joints
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Detail EJ171-98

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-09 Test Reports

Tests, Inspections and Verifications

A written report within 7 calendar days after completion of the work, covering the testing required for each lot.

SD-14 Samples

Brick Pavers; G
Color Samples; G

A sample of five brick pavers prior to the start of the work. Also, a representative sample of not less than 15 blocks as directed by the Contracting Officer, from each lot of 20,000 concrete brick pavers or fraction thereof.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Mortar

Mortar for exterior paver application: Fast-setting, fast-curing, two-component, latex hydraulic mortar with additive. Standard of acceptance for normal setting applications:

Laticrete 272 with Laticrete 333 additive.

2.1.2 Joint Filler

Grout for exterior paver application, standard of acceptance: Quikcrete Masons Mix, ASTM C 270 or approved equal.

2.1.3 Brick Paver

2.1.3.1 Brick Pavers Within Walkway

The walkway brick pavers shall be rated for PEDESTRIAN AND LIGHT TRAFFIC LOADS. These brick pavers shall conform to ASTM C 902, and shall be 2-1/4 inches thick, 4 inches wide, and 8 inches long. The brick pavers shall feature chamfers on both bed surfaces (both sides, top & bottom) for reversibility; spacer bars on all four ends to control joint size and chippage; full range, through the body color shall possess minimum 12,500 p.s.i. compressive strength and a water absorption rate less than 5.5%.

2.1.3.2 Brick Pavers Within Crosswalks

The crosswalk brick pavers shall be rated for HEAVY TRAFFIC LOADS. These brick pavers shall conform to ASTM C 1272, and shall be 2-3/4 inches thick, 4 inches wide, and 8 inches long. The brick pavers shall feature chamfers on both bed surfaces (both sides, top & bottom) for reversibility; spacer bars on all four ends to control joint size and chippage; full range, through the body color shall exceed 13,000 p.s.i. compressive strength and possess a water absorption rate less than 5.0%.

2.1.4 Edge Restraint and Base

2.1.4.1 Reinforced Cast-In-Place Concrete

The edge restraint and base shall be reinforced Portland cement concrete placed with the dimensions and reinforcement shown on the plans. Concrete shall conform to the requirements of ACI 301, except that it shall have a compressive strength of not less than 4000 p.s.i. at 28 days. Concrete shall conform to Section 03300b CAST-IN-PLACE CONCRETE

2.2 TESTS, INSPECTIONS AND VERIFICATIONS

2.2.1 Brick Paver

The Contractor shall conduct the tests prescribed by ASTM C 936 and the following tests on the remaining 13 pavers of each sample from each lot.

2.2.1.1 Freezing and Thawing

Resistance to freezing and thawing shall be determined in accordance with Section 8 of ASTM C 67 for five brick pavers. The brick pavers shall have no breakage and no more than 1.0 percent loss of any individual unit in dry weight when subjected to 150+ cycles of freezing and thawing.

2.2.1.2 Dimensional Tolerance

The length and width of each brick paver in the sample shall not vary from any other brick paver in this or any other lot sample by more than 1/8 inch (application PX, ASTM C 902). Thickness of any brick paver in the sample shall not vary by more than 1/8 inch from the specified brick paver thickness (application PX, ASTM C 902).

2.2.1.3 Retest

The Contractor shall notify the Contracting Officer if any brick pavers fail to meet the specified requirements. In case the shipment fails to conform to the specified requirements, the Contractor may sort it, and new specimens shall be selected by the Contractor from the retained lot for retesting, as directed by the Contracting Officer. All brick paver retests shall be performed at the expense of the Contractor. In case the second set of specimens fail to conform to the test requirements, the entire lot shall be rejected.

2.3 QUALITY ASSURANCE

2.3.1 Installer Qualifications

An experienced installer who is specialized at this type of paver installation and has been actively installing this type of work for no less than five (5) years.

2.3.1.1 Submit With Quote Form

A list of not less than five (5) installations that have been in service for a period of at least five (5) years in facilities similar to this one (in size, scope, and type) shall be provided; with contact name and phone number.

2.4 ACCEPTABLE MANUFACTURER (Or Equal)

Pine Hall Brick Co., Inc.
P.O. Box 11044
Winston-Salem, NC 27116-1044
TEL: 336-721-7500; 800-334-8689
FAX: 336-725-3940
E-mail: info@pinehallbrick.com

Paver Measurements and Load Parameters:

See paragraphs 2.1.3.1, 2.1.3.2 and 2.2.1.2 of this specification.

Paver Types (Or Equal):

Pedestrian/Light Traffic Loads (Walkway Ramp Applications): "Pine Hall Brick Co. - English Edge", rated for ASTM C 902

Heavy Traffic Loads (Crosswalk Applications):

"Pine Hall Brick Co. - English Edge", rated for ASTM C 1272

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Reinforced Concrete Edge Restraint and Base

The reinforced concrete edge restraint and base shall be placed as shown on the drawings and shall be installed prior to placement of the brick pavers.

3.1.1.1 Concrete Base Thickness for Pedestrian Walk Applications

All pedestrian walkway ramp applications shall receive a 4 inch thick reinforced concrete base, with WWF 6 X 6 - W2.9 X W2.9.

3.1.1.2 Concrete Base Thickness for Crosswalk Applications

All crosswalk applications shall receive a 6 inch thick reinforced concrete base, with WWF 6 X 6 - W2.9 X W2.9 reinforcement.

3.1.2 Expansion and Control Joints

Determine expansion and control joint locations and obtain the approval of the Contracting Officer for site layout of the joints, prior to commencing with the installation.

3.1.2.1 Expansion and Control Joint Layout

Provide expansion and control joints in accordance with TCA (Tile Council of America) Detail No. EJ171-98, as follows:

- a. Provide expansion joints at maximum 12'-0" o.c. in each direction.
- b. Provide control joints at points where dissimilar materials come in contact with the brick paver.
- c. Carry expansion joints completely through the assembly.
- d. Keep expansion joints clear of setting material and grout.
- e. Use specified sealant in joints, Section 03300b CAST IN PLACE CONCRETE.

3.2 BRICK PAVER PLACEMENT

The brick pavers shall be placed by hand. Placement of the brick pavers shall start from a corner or straight edge and proceed forward over the undisturbed mortar bed. The joints, excluding any chamfer between brick pavers, shall be 1/16 inch in width. After seating, the brick paver surface shall be flush or up to 1/4 inch above the edge restraint.

3.2.1 Brick Paver Installation on Concrete Slab

- a. Install pavers on concrete substrate in accordance with TCA (Tile Corporation of America) Detail No. F102-98.
- b. Mix and use setting and grout material in accordance with the manufacturer's instructions.
- c. Cut brick pavers without damage to exposed faces and edges.
- d. Lay out pavers parallel to the main axes of the walkway/ramp/crosswalk.
- e. Refer to manufacturer's instructions, data sheets and specifications for acceptable curing times and allow no less than recommended times for setting mortar to cure, before filling joints.

3.2.2 Unfilled Gaps

Any gaps between paving blocks and any edge restraint, drainage structures, or other members that cannot be filled with a whole block shall be filled with a paving block cut to fit the gap, except that slivers will not be allowed and the minimum cut paver size allowed shall not be less than one-fourth (1/4) the size of a full brick paver. Cutting shall be done with a hydraulic splitter, a masonry saw, or other device that accurately leaves a clean, vertical face without spalling. Any remaining gap between the block and adjoining edge restraint or structure greater than 1/4 inch will not be accepted; adjacent brick pavers shall be cut or rearranged to prevent this.

3.2.3 Joint Filling Between Brick Pavers

Quikcrete Masons Mix ASTM C 270 shall be swept into the joints with a minimum of two thorough applications to all joints. This process shall be continued until all joints have been thoroughly filled and further applications cannot be forced into the joints. The remaining joint filler particles and any excess shall be swept off the pavement. Follow manufacturer's instructions for mixing.

3.2.4 Timing of Operations

Seating of brick pavers and placement of joint filler can be done concurrently with brick paver placement. However, seating of brick pavers and placement of

joint filler shall not be done within 5 feet of any unfinished edge of the brick pavers that is not supported by the reinforced concrete edge restraint.

3.2.5 Construction Traffic

Construction traffic shall not be allowed on the brick paver surface until the joint filler has been allowed to set a minimum of 24 hours following installation and all debris has been cleaned off from the pavement.

3.3 CLEANUP

The Contractor shall clean the entire pavement surface and remove all excess mortar, joint filler, brick pavers, and debris from the project area.

3.4 SMOOTHNESS AND GRADE TOLERANCES

3.4.1 Smoothness

No portion of the finished pavement surface shall deviate by more than 3/8 inch from a 10 foot long metal straightedge placed on the pavement surface.

3.4.2 Brick Paver Height

The finished brick pavement surface shall be either flush or up to 1/4 inch higher than all edge restraints or drainage structures.

3.4.3 Grade

The finished brick pavement shall be within 1/2 inch (0.04 feet) of planned grade shown on the plans.

3.4.4 Remedial Action

Any area not meeting the smoothness, brick paver height, or grade tolerance shall be taken up, adjustments made, and the brick pavers relayed.

DIVISION 2 - SITEWORK

SECTION 02832b

SEGMENTAL CONCRETE BLOCK RETAINING WALL

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SECTION 02832b

SEGMENTAL CONCRETE BLOCK RETAINING WALL

PART 1 GENERAL

This work element includes engineering in addition to the construction requirements. The NCMA design method for segmental retaining walls considers potential failure modes categorized by external, internal, local, compound, and global stability. The Government has considered the global stability and has provided the minimum design requirements on the drawings. The Contractor is responsible for engineering services that include analysis of the wall for all modes of stability, and providing shop drawings indicating all features of the complete design.

1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

- | | |
|--------------|---|
| AASHTO M 252 | (1996) Corrugated Polyethylene Drainage
Tubing |
| AASHTO M 288 | (1996) Geotextiles Used for Subsurface
Drainage Purposes |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- | | |
|-------------|---|
| ASTM C 136 | (1996a) Sieve Analysis of Fine and Coarse
Aggregates |
| ASTM C 140 | (1997) Sampling and Testing Concrete Masonry
Units |
| ASTM C 920 | (1998) Elastomeric Joint Sealants |
| ASTM C 1262 | (1997) Evaluating the Freeze-Thaw Durability
of Manufactured Concrete Masonry Units and
Related Concrete Units |
| ASTM C 1372 | (1997) Segmental Retaining Wall Units |
| ASTM D 448 | (1986; R 1993) Sizes of Aggregate for Road
and Bridge Construction |
| ASTM D 698 | (1998) Laboratory Compaction Characteristics
of Soil Using Standard Effort (12,400 ft-
lbf/cu. ft. (600 kN-m/cu. m.)) |

ASTM D 1241	(1968; R 1994) Materials for Soil-Aggregate Subbase, Base, and Surface Courses
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2487	(1993) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 2488	(1993) Description and Identification of Soils (Visual-Manual Procedure)
ASTM D 2922	(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
ASTM D 4355	(1992) Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491	(1996) Water Permeability of Geotextiles by Permittivity
ASTM D 4595	(1986; R 1994) Tensile Properties of Geotextiles by the Wide-Width Strip Method
ASTM D 4632	(1991; R 1996) Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1995) Determining Apparent Opening Size of a Geotextile
ASTM D 4873	(1997) Identification, Storage, and Handling of Geosynthetic Rolls
ASTM D 5321	(1992) Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method

FEDERAL HIGHWAY ADMINISTRATION (FHWA)

FHWA SA-96-071	(1997) Mechanically Stabilized Earth Walls and Reinforced Soil Slopes: Design and Construction Guidelines
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GEOSYNTHETIC INSTITUTE (GSI)

GSI GRI GG1	(1988) Geogrid Rib Tensile Strength
GSI GRI GG5	(1991) Geogrid Pullout
GSI GRI GG6	(1992) Grip Types for Use in the Wide Width Testing of Geotextiles and Geogrids

GSI GRI GT6

(1992) Geotextile Pullout

NATIONAL CONCRETE MASONRY ASSOCIATION (NCMA)

NCMA SRWU-1 (1997) Determination of Connection Strength
between Geosynthetics and Segmental Concrete
Units

NCMA SRWU-2 (1997) Determination of Shear Strength
between Segmental Concrete Units

NCMA SRW Manual (1997) Design Manual for Segmental Retaining
Walls, 2nd Edition

NCMA Seismic Manual (1998) Segmental Retaining Walls - Seismic
Design Manual, 1st Edition

1.2 DEFINITIONS

- a. Blocks. Segmental concrete retaining wall units will be referred to as blocks.
- b. Drainage Aggregate. Granular soil or aggregate which is placed within, between, and/or immediately behind segmental concrete units.
- c. Fill. Soil or aggregate placed in, behind, or below the wall will be referred to as fill.
- d. Reinforced Fill. Soil which is placed and compacted within the neat line volume of reinforcement as outlined on the plans.
- e. Retained Fill. Soil which is placed and compacted behind the reinforced fill.
- f. Reinforcement. Reinforcement shall consist of a geogrid or a geotextile product manufactured for use as reinforcing. Reinforcement shall not include steel products.
- g. Long Term Design Strength. The long term design strength (LTDS) is:

$$LTDS = T_{ult} / (RF_D * RF_{ID} * RF_{CR})$$

where:

T_{ult} is the ultimate strength
 RF_D is the reduction factor for chemical and biological durability
 RF_{ID} is the reduction factor for installation damage
 RF_{CR} is the reduction factor for creep

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-04 Drawings: GA

Shop Drawings

The fabrication and installation drawings shall be submitted. The shop drawings shall include all items described under paragraph SEGMENTAL RETAINING WALL DESIGN.

SD-01 Data

Manufacturer's Data: FIO

The Contractor shall submit descriptive technical data on the blocks, wall caps, masonry adhesive, reinforcement and geotextile filter materials. The submittal shall include all material properties specified under paragraph PRODUCTS. The submittal shall also include a copy of any standard manufacturer's warranties for the products.

Qualifications: FIO

The Contractor shall provide documentation showing that the installer and supplier meet the qualifications listed.

Soil Testing

Reinforcement Testing

The Contractor shall submit testing data specific to the blocks and reinforcement to be supplied.

a. The shear strength between blocks shall be established in accordance with NCMA SRWU-2.

b. The connection strength between the blocks and the reinforcement shall be established in accordance with NCMA SRWU-1. If the FHWA design method is used, the modifications in FHWA SA-96-071 shall be implemented.

c. The coefficient for direct shear of the reinforcement on a soil similar in gradation and texture to the material that will be used for fill in the reinforced zone shall be established in accordance with ASTM D 5321.

d. The coefficient of interaction for pull-out resistance of the reinforcement in a soil similar in gradation and texture to the material that will be used for fill in the reinforced zone shall be established in accordance with GSI GRI GG5 or GSI GRI GT6.

Calculations

The Contractor shall submit a calculation of the long term design strength for the reinforcement in accordance with the NCMA or FHWA design method. The ultimate strength or index strength shall be based on the minimum average roll value tensile strength of the product using the wide width strength test in ASTM D 4595 or the single rib test in GSI GRI GG1. The calculation shall itemize each

reduction factor and include backup data to justify each reduction factor.

The Contractor shall submit design calculations, including computer output data and program documentation. The calculations shall include all items described under PARAGRAPH: SEGMENTAL RETAINING WALL DESIGN.

SD-14 Samples

Segmental Concrete Units: FIO

The Contractor shall submit two samples of each proposed block. Each sample shall be typical of the size, texture, color, and finish.

Reinforcement: FIO

The Contractor shall submit samples of each type of reinforcement. The samples shall be labeled and have a minimum size 8 by 10 inches. Geogrid shall include at least 2 apertures (3 junctions) in each direction.

SD-13 Certificates

Reinforcement: FIO

The Contractor shall submit an affidavit certifying that the reinforcement meets the project specifications. The affidavit shall be signed by an official authorized to certify on behalf of the manufacturer and shall be accompanied by a mill certificate that verifies physical properties were tested during manufacturing and lists the manufacturer's quality control testing. The documents shall include a statement confirming that all purchased resin used to produce reinforcement is virgin resin. The mill certificate shall include the tensile strength tested in accordance with either ASTM D 4595 or GSI GRI GG1.

1.4 SEGMENTAL RETAINING WALL DESIGN

The Contractor shall complete all stability analyses in accordance with either the NCMA SRW Manual, or the Federal Highway Administration/AASHTO method detailed in FHWA SA-96-071. Only one method shall be followed for the complete design, including reinforcement design strength, layout, stability calculations, and seismic effects. The segmental retaining wall system shall be designed under the direction of, and be signed by, a professional engineer. The engineer shall visit the job at least once before construction begins and as often as required by the Contracting Officer during the construction.

1.4.1 Design

Calculations shall include determination of long term design strength of reinforcement specific to this project in accordance with the NCMA SRW Manual or FHWA SA-96-071. Calculations shall include analysis of all failure modes listed in the NCMA SRW Manual. Design calculations shall include a clear outline of material properties and assumptions

1.4.1.1 External Stability Design Requirements

As a minimum requirement, the length of the reinforcing at the base of the wall shall not be less than 0.7 times the total height of the blocks.

1.4.2 Layout

Shop drawings shall reflect all information needed to fabricate and erect the walls including the leveling pad elevations; the shape and dimensions of wall elements; the number, size, type, and details of the soil reinforcing system and anchorage; and identification of areas requiring coping. The design and layout of the internal reinforcement shall be subject to the following:

- a. All features indicated in the contract documents shall be incorporated in the final design and construction.
- b. Each reinforcement level shall run as continuous as practical throughout the profile. If a geotextile filter is present, the reinforcement shall be laid out so that interference with the geotextile is minimized.
- c. Any reinforcement not placed with the machine direction as the design reinforcement direction shall be identified on the shop drawings.
- d. Reinforcement attached to the wall facing shall not combine geogrid and geotextile, nor products from different manufacturers, within one wall. The number of reinforcement products shall be limited to avoid confusion in placement. For walls under 12 feet high, all reinforcement shall be the same grade and strength (i.e. design with one reinforcement strength).

1.5 CONTRACTOR QUALIFICATIONS

The job foreman or the company directly responsible for the wall installation shall have completed a minimum of 10 segmental concrete retaining wall projects.

1.6 SUPPLIER QUALIFICATIONS

Suppliers of segmental retaining wall system components shall have demonstrated experience in the supply of similar size and types of segmental retaining walls on previous projects.

1.7 MANUFACTURER'S REPRESENTATIVE

The Contractor shall have a qualified and experienced representative from the block or reinforcement manufacturer available on an as-needed basis during the wall construction. The representative shall visit the site for consultation as requested by the Contracting Officer.

1.8 DELIVERY, STORAGE AND HANDLING

The Contractor shall check products upon delivery to assure that the proper material has been received and is undamaged. For geosynthetics, the guidelines presented in ASTM D 4873 shall be followed.

1.8.1 Segmental Concrete Units and Wall Caps

The Contractor shall protect blocks from damage and exposure to cement, paint, excessive mud, and like materials. The Contractor shall check materials upon delivery to assure that the block dimensions are within the tolerances specified.

1.8.2 Geosynthetic Labeling

Each roll shall be labeled with the manufacturer's name, product identification, roll dimensions, lot number, and date manufactured.

1.8.3 Geosynthetic Handling

Geosynthetic rolls shall be handled and unloaded by hand, or with load carrying straps, a fork lift with a stinger bar, or an axial bar assembly. Geosynthetic rolls shall not be dragged, lifted by one end, lifted by cables or chains, or dropped to the ground.

1.8.4 Geosynthetic Storage

Geosynthetics shall be protected from cement, paint, excessive mud, chemicals, sparks and flames, temperatures in excess of 160 degrees F, and any other environmental condition that may degrade the physical properties. If stored outdoors, the rolls shall be elevated from the ground surface. Geosynthetics, except for extruded grids, shall be protected with an opaque waterproof cover. Geosynthetics shall be delivered to the site in a dry and undamaged condition. Geotextiles shall not be exposed to direct sunlight for more than 7 days.

PART 2 PRODUCTS

2.1 SEGMENTAL CONCRETE UNITS

2.1.1 Architectural requirements

- a. Face color - Tan
- b. Face Texture - split face typical of broken mortar
- c. Face Appearance - straight, single-surface face
- d. Batter - Blocks shall be engaged to the block below by use of keys, lips, pins, clips, or other reliable mechanism to provide a consistent wall batter between 1H:10V and 1H:16V.
- e. Block Size - a minimum of 2/3 square feet of face area, and minimum 6 inch height.
- f. Bond configuration - No bond configuration is required for straight face blocks. Beveled or sculptured face blocks shall be designed to

stack with a half-bond (joints located at midpoint of vertically adjacent blocks). The block edges shall be finished so that vertical joints are flush.

2.1.2 Structural requirements

The blocks shall be manufactured to the requirements of ASTM C 1372, except for the following modifications:

- a. Minimum 28-day compressive strength of [4500 psi]], based on net area in accordance with ASTM C 140.
- b. A maximum moisture absorption rate of 9 pcf, in accordance with ASTM C 140.
- c. The minimum oven dry density of concrete shall be 125 pcf.
- d. The blocks shall provide a minimum of 80 pounds per square foot of wall face area (determined without void filling).
- e. For freeze-thaw durability tested in accordance with ASTM C 1262, specimens shall comply with either of the following: (1) the weight loss of each of 5 specimens after 100 cycles shall not exceed 1 percent; or (2) the weight loss of each of 5 specimens after 150 cycles shall not exceed 1.5 percent.

2.2 REINFORCEMENT

2.2.1 Geogrid Reinforcement

Geogrid shall be a geosynthetic manufactured for reinforcement applications. The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil, aggregate, or other fill materials. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. The geogrid shall be manufactured with 100 percent virgin resin consisting of polyethylene, polypropylene, or polyester, and with a maximum of 5 percent in-plant regrind material. Polyester resin shall have a minimum molecular weight of 25,000 and a carboxyl end group number less than 30. Polyethylene and polypropylene shall be stabilized with long term antioxidants.

2.2.2 Geotextile Reinforcement

Geotextile shall be a pervious sheet of polymeric material and shall consist of long-chain synthetic polymers composed of at least 95 percent by weight polyethylene, polypropylene, or polyesters. The geotextile shall be manufactured with 100 percent virgin resin, and with a maximum of 5 percent in-plant regrind material. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the selvages. Polyester resin shall have a minimum molecular weight of 20,000 and a carboxyl end group number less than 50. Polyethylene and polypropylene shall be stabilized with long term antioxidants.

For survivability during installation, and in addition to installation damage used in calculating the long term design strength, the geotextile

shall meet the minimum requirements in AASHTO M 288 Class 1, and shall have a minimum mass per unit area of 8 oz/sy.

2.2.3 Reinforcement Properties

The reinforcement shown in the approved shop drawing submittal shall meet the long term design strength requirements used in the design. Reinforcement strength requirements represent minimum average roll values in the machine direction.

2.2.3.1 Long Term Design Strength

The long term design strength shall be based on reduction factors for installation damage and durability that are applicable to the fill that will be used. Minimum reduction factors for durability include: 1.1 for polyethylene and polypropylene geosynthetics, 1.15 for coated polyester geogrids, and 1.6 for polyester geotextiles. The creep reduction factor must be consistent with the test procedure used for determining the ultimate strength.

2.3 GEOTEXTILE FILTER

Geotextiles used as filters shall meet the requirements specified in Table 2. The property values (except for AOS) represent minimum average roll values (MARV) in the weakest principal direction. For survivability during installation, the geotextile shall meet the minimum requirements in AASHTO M 288 Class 2, and shall have a minimum mass per unit area of 8 oz/sy.

TABLE 2. GEOTEXTILE PHYSICAL PROPERTIES

PROPERTY	TEST REQUIREMENT	TEST METHOD
Grab Tensile, lbs.	160 nonwoven 250 woven	ASTM D 4632
Apparent Opening Size (U.S. Sieve)	70 - 100	ASTM D 4751
Permittivity, sec-1	0.5	ASTM D 4491

2.4 SOILS AND AGGREGATES

All material placed as fill shall consist of material classified by ASTM D 2487 as GW, GP, GC, GM, SP, SM, SC, CL, ML, or SW. The material shall be free of ice; snow; frozen earth; trash; debris; sod; roots; organic matter; contamination from hazardous, toxic or radiological substances; or stones larger than 3 inches in any dimension. Each material shall be obtained entirely from one borrow source, unless the Contracting Officer determines that quality control is adequate and the alternate source produces material that is similar in gradation, texture, and interaction with the reinforcement. The Contractor shall supply any testing required by the Contracting Officer to evaluate alternate sources. All materials shall be of a character and quality satisfactory for the purpose intended.

- a. Drainage Aggregate shall meet the requirements of ASTM D 448, size No.7.

b. Aggregate Base material for the wall leveling pads shall meet the requirements of ASTM D 1241, gradation C.

c. Reinforced Fill. Soil placed in the reinforced fill zone shall consist of granular material with less than 10 percent passing the No. 200 sieve.

c. Retained Fill. Soil placed in the retained fill zone shall consist of on-site soils excavated for wall construction or, otherwise, shall meet the minimum requirements for reinforced fill.

2.5 MASONRY ADHESIVE

The masonry adhesive shall meet the following requirements:

- a. ASTM C 920, Type S, Grade NS, Class 25
- b. expected 30 year life
- c. meet the recommendations of the block manufacturer

2.6 DRAINAGE PIPE

The drainage pipe shall be corrugated polyethylene pipe meeting requirements of AASHTO M 252.

PART 3 EXECUTION

3.1 CLASSIFICATION OF SOIL MATERIALS

Classification of soil materials shall be performed by the Contractor in accordance with ASTM D 2488. The Contracting Officer reserves the right to revise the Contractor classifications. In the case of disagreement, the Contracting Officer's classification will govern unless the soils are classified in accordance with ASTM D 2487. All testing completed by the Contractor in conjunction with soil material classification will be considered incidental to the contract work.

3.2 EARTHWORK

The leveling pad and reinforced fill zone shall bear on undisturbed native soils, or acceptably placed and compacted fill. In the event that it is necessary to remove material to a depth greater than specified or to place fill below the leveling pad not otherwise provided for in the contract, the Contracting Officer shall be notified prior to work and an adjustment in the contract price will be considered in accordance with the contract. Additional work not authorized by the Contracting Officer shall be at the Contractor's expense.

3.2.1 Excavation

Foundation soil shall be excavated as required for leveling pad dimensions and reinforcement placement shown on the construction drawings. Material for backfilling shall be stockpiled in a neat and orderly manner at a sufficient distance from the banks of the excavation to avoid overloading and to prevent slides or caving. Excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. The Contractor is responsible for disposal of surplus material, waste material, and material that does not meet specifications, including any soil which is

disturbed by the Contractor's operations or softened due to exposure to the elements and water.

3.2.2 Stockpiles

Stockpiles of all material to be incorporated into the work shall be kept in a neat and well drained condition, giving due consideration to drainage at all times. The ground surface at stockpile locations shall be cleared, grubbed, and sealed. Topsoil shall be stockpiled separately from suitable backfill material. Stockpiles of aggregates and granular soils shall be protected from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes frozen, saturated, intermixed with other materials, or otherwise out of specification or unsatisfactory for the use intended, such material shall be removed and replaced with new material from approved sources at no additional cost to the Government.

3.3 LEVELING PAD OPTIONS

3.3.1 Aggregate Base Leveling Pad

The subgrade below the leveling pad shall be compacted with at least 3 passes with a vibratory plate compactor with an operating weight not less than 450 pounds. The aggregate base material shall be placed in lifts not exceeding 6 inches and compacted with at least 3 passes with a vibratory plate compactor. If the subgrade or aggregate base pumps, bleeds water, or cracks during compaction, the Contracting Officer shall be notified and, if no other changes are directed, the aggregate shall be replaced with a concrete leveling pad.

3.3.2 Concrete Leveling Pad

Tolerances in screeding shall be sufficient to place the blocks directly on the leveling pad without mortar, pointing, or leveling course between the blocks and leveling pad.

3.4 BLOCK INSTALLATION

The wall system components shall be constructed in accordance with the wall supplier's recommendations and construction manual. Damaged blocks shall not be incorporated in the retaining wall.

a. Block placement shall begin at the lowest leveling pad elevation. The blocks shall be in full contact with the leveling pad. Each course of block shall be placed sequentially for the entire wall alignment to maintain a level working platform for layout of reinforcement and placement of fill.

b. The grade and alignment of the first course shall be surveyed and the results furnished to the Contracting Officer prior to placing the second course. Survey control for alignment shall include a string line, offset from a base line, or suitable provisions that can be reproduced for quality assurance.

c. The blocks shall be placed with the edges in tight contact. The vertical joints shall be maintained with a minimum 4 inch overlap on

the underlying block. Coping required to keep block alignment shall be done with a full depth saw cut. No splitting shall be allowed.

d. Stacking of blocks prior to filling any lower course of block with drainage aggregate will not be allowed.

e. Cap units shall be joined using masonry adhesive. Care shall be taken to keep adhesive from coming into contact with the face of wall units.

3.5 REINFORCEMENT INSTALLATION

a. Before placing reinforcement, the subgrade or subsequent lift of fill shall be compacted and graded level with the top of the blocks. The surface shall be smooth and free of windrows, sheepfoot impressions, and rocks.

b. Reinforcement shall be placed at the elevations and to the extent shown on the construction drawings and the approved shop drawing submittal. Reinforcement shall be oriented with the design strength axis perpendicular to the wall face. Each segment of reinforcement shall be continuous. Spliced connections between shorter pieces of reinforcement will not be allowed. Reinforcement strips shall be placed immediately next to adjacent strips to provide 100 percent coverage.

c. The reinforcement shall be installed in tension. The reinforcement shall be pulled taut and anchored with staples or stakes prior to placing the overlying lift of fill. The tension shall be uniform along the length of the wall and consistent between layers.

d. All reinforcement shall be 100% covered by soil so that reinforcement panels do not contact in overlaps. Where the wall bends, a veneer of fill shall be placed to a nominal thickness of 3 inches to separate overlapping reinforcement.

3.6 FILL PLACEMENT

a. Fill placement, including drainage aggregate, shall be completed to the top of each course of facing blocks prior to stacking the subsequent course of blocks.

b. Reinforced fill shall be placed from the wall back toward the fill area to ensure that the reinforcement remains taut. Fill shall be placed, spread, and compacted in such manner that minimizes the development of wrinkles in or movement of the reinforcement.

c. A minimum fill thickness of 6 inches is required prior to operation of vehicles over the reinforcement. Sudden braking and sharp turning shall be avoided. Tracked equipment shall not turn within the reinforced fill zone to prevent tracks from displacing the fill and damaging the reinforcement. Construction equipment shall not be operated directly upon the reinforcement as part of the planned construction sequence. Rubber tired equipment may operate directly on the reinforcement if: the Contractor submits information documenting testing of equipment operating on a similar geogrid product on similar soils, the travel is infrequent, equipment travels slow, turning is

minimized, and no damage or displacement to the reinforcement is observed.

d. Drainage aggregate shall be placed and tamped directly behind, between, and within the cells of the facing units. Compaction of the drainage aggregate shall be achieved by at least two passes on each lift with a vibratory plate compactor. Care shall be taken not to contact or chip the blocks with the compactor. Aggregate placed within the block cores and recesses shall be compacted by hand tamping and rodding.

e. At the end of each day, the Contractor shall slope the last lift of fill away from the wall in a manner that will allow drainage and direct runoff away from the wall face.

3.7 COMPACTION

Fill shall not be placed on surfaces that contain mud, frost, organic soils, fill soils that have not met compaction requirements, or where the Contracting Officer determines that unsatisfactory material remains in or under the fill. Fill shall be spread and compacted in lifts not exceeding the height of one course of blocks.

3.7.1 Degree of Compaction

Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698. The maximum density is hereafter abbreviated as the "Standard Proctor" value.

3.7.2 Moisture Control

Control of moisture in the fill shall be maintained to provide acceptable compaction. Disking and plowing will not be allowed in the reinforced fill zone. Moisture content of cohesive soils shall be adjusted at the borrow source before placement. Adding water directly to the reinforced fill zone shall only be conducted under conditions where the soil has sufficient porosity and capillarity to provide uniform moisture throughout the fill during compaction.

3.7.3 Compaction

Reinforced and retained fill shall be compacted to 95 percent of the Standard Proctor Density. Care shall be exercised in the compaction process to avoid misalignment of the facing blocks. Heavy compaction equipment (including vibratory drum rollers) shall not be used within 3 feet from the wall face.

3.8 SOIL TESTING

3.8.1 General

All testing expenses shall be the Contractor's responsibility. Prior to sampling and testing the work, testing laboratories shall be inspected and approved in accordance with Section 01451b, CONTRACTOR QUALITY CONTROL. The Contracting Officer reserves the right to direct the location and select the material for samples to be tested and to direct where and when moisture-

density tests shall be performed. Nuclear density testing equipment shall be used in accordance with ASTM D 2922.

3.8.2 Corrective Action.

Tests of materials which do not meet the contract requirements (failing test) will not be counted as part of the required testing. Each such failing test must be retaken at the same location as the failing test was taken. If testing indicates material does not meet the contract requirements, the material represented by the failing test shall not be placed in the contract work or shall be recompacted or replaced. The quantity of material represented by the failing test shall be determined by the Contracting Officer up to the quantity represented by the testing frequency. The Contractor may increase testing frequency in the vicinity of a failing test in order to reduce removal requirements, as approved by the Contracting Officer. Such increases in testing frequency shall be at the Contractor's expense and at no additional cost to the Government.

3.8.3 Testing Schedule

Moisture-Density Relations (ASTM D 698)

One test for each type of material.

In-Place Densities (ASTM D 1556 or ASTM D 2922)

Not less than 1 test for each vertical foot per 300 linear feet along wall face.

Sieve Analysis, (ASTM C 136)

- (1) Drainage Aggregate, 1 test for each source.
- (2) Reinforced Fill, 1 test for each source.

3.9 DRAINAGE PIPE

Drain pipe shall be placed as indicated on the drawings. Drain lines shall be laid to true grades and alignment with a continuous fall in the direction of flow. The interior of the pipe shall be kept clean from soil and debris; and open ends shall be temporarily capped as necessary.

3.10 CONSTRUCTION TOLERANCES

a. Horizontal: The top of wall shall be within 3 inches of the plan location.

b. Vertical: The top of wall elevations shall be within 0.1 feet above to 0.1 feet below the prescribed top of wall elevations shown on the drawings.

c. Plumbness and Alignment: The wall batter and alignment offset measured as deviation from a straight edge shall be within plus or minus 1.25 inches per 10 feet section. The batter measured from vertical shall be within 2 degrees of the plan dimension.

d. Block Defects: The blocks will be accepted on the basis of tolerances specified in ASTM C 1372.

e. Block Gaps: Gaps between adjacent blocks shall not exceed 1/8 inches.

3.11 PROTECTION OF WORK

Work shall be protected against damage from subsequent operations. Disturbed or displaced blocks shall be removed and replaced to conform to all requirements of this section. Damaged material shall not be incorporated into the wall. Upon completion of wall erection, the Contractor shall clean the wall face to remove any loose soil deposits or stains.

DIVISION 2 - SITE WORK

SECTION 02871b

SITE FURNISHINGS

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SECTION 02871b

SITE FURNISHINGS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications shall be referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997ael) Carbon Structural Steel
ASTM A 123/A 123M	(1997ael) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 276-00a	(2001) Standard Specification for Stainless Steel Bars and Shapes
ASTM A 755/A755M-99	(2001) Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products
ASTM A 500	(1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(1999) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 615/A 615M	(1996ael) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 150	(1999a) Portland Cement
ASTM F 593-98	(2001) Standard Specification For Stainless Steel Bolts, Hex Cap Screws, and Studs

NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE NO. 1 TO NO. 2	Removal of macro-rust, mill scale and exposed surface metal, and to etch surfaces for adhesion
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STRUCTURAL STEEL PAINTING COUNCIL (SSPC)

SSPC SP-5 TO SP-10	Metal blast methods using synthetic silica grit.
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-04 Shop Drawings; G

Site Furnishings Standards;

Drawings showing scaled details of proposed site furnishings, elevations for each type of site furnishing; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction.

Installation; FIO

Manufacturer's installation and maintenance manual.

Materials; FIO

A listing indicating the furnishings provided have been in proven satisfactory use for at least 2 years.

SD-09 Test Reports

Testing; FIO

A report of post-installation test results.

SD-14 Samples

Finish; FIO

Two sets of color data for the site furnishings displaying manufacturer's color selections and finishes, and identifying those colors and finishes proposed for use.

1.3 DELIVERY, STORAGE, AND HANDLING

Unload materials with necessary equipment per manufacturer's instructions store covered out of weather, and keep out of direct sun. Inspect parts within 48 hours of delivery, compare with manufacturer's bill of material, and report any missing or non-conforming parts to manufacturer within this time. The storage area shall be as designated. The materials shall be stored in a dry, covered area until installed.

1.4 INSPECTION

Site furnishings shall be inspected upon arrival at the job site for conformity to specifications and quality in accordance with paragraph MATERIALS. Unacceptable items shall be removed from the job site.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory use for at least 2 years.

2.1.1 Concrete

Portland cement shall conform to ASTM C 150 Types I, II, or III.

2.1.1.1 Cast-in-Place Concrete

Cast-in-place concrete materials and products shall conform to Section 03300b CAST-IN-PLACE CONCRETE.

2.1.2 Metal

Metallic materials and products shall conform to Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS. Metal components shall be furnished with factory drilled holes. Components shall be free of excess weld and spatter. Metal components with holes that will not be filled by hardware or hidden by other components will be rejected.

2.1.2.1 Steel

Structural steel products shall conform to ASTM A 36/A 36M, ASTM A 500 and ASTM A 501.

2.1.2.2 Reinforcing Steel

Steel used for reinforcement shall be deformed billet steel [Grade 40]. Steel shall conform to ASTM A 615/A 615M.

2.2 SUMMARY

This Section addresses site furnishings with accommodations for the following:

- A. Trash Receptacles
- B. Bike racks

2.3 SUBMITTALS

2.3.1 Product Data

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all handrails/guardrails and posts.

2.3.2 Shop Drawings

Plans, elevations, and sections for railings, post, accessories, and attachments to other work.

2.3.3 Samples for Initial Selection

Manufacturer's color charts consisting of units or sections of units showing the full range of finishes, colors, textures, and patterns available for each exposed material.

2.3.3.1 Color Selection

Submit 3 sets of color tiles from the manufacturer. Submit color tile samples to the Contracting Officer for final color selection approval.

2.3.4 Samples for Verification

For each type of exposed finish required, prepared on Samples of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

2.3.5 Maintenance Data

2.3.5.1 Maintenance Manuals

Provide and include the following procedures in a handrail/guardrail maintenance manual:

- 1) Methods for maintaining finish
- 2) Precautions for cleaning materials and methods that could be detrimental to the handrail/guardrail performance.

2.4 QUALITY CONTROL

2.4.1 Installer Qualifications

An experienced installer who has specialized in installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

A list of not less than five (5) installations that have been in service for a period of at least five (5) years in facilities similar to this one in size, scope and type shall be provided; contact name and phone number.

2.4.2 Source Limitations

Obtain each type of material and mounting components through one source from a single manufacturer.

2.4.3 Warranty

Supply a minimum five-year warranty period.

2.4.4 Project Conditions

2.4.4.1 Field Measurements

Verify area by field measurements before material fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

2.4.5 Acceptable Manufacturers

BRP Enterprises, Lincoln, NE, receiving pricing from Hammill & Associates, Inc. Birmingham, AL / 800-423-6661.

-OR EQUAL-

For the following site furnishing: BIKE RACK

Wabash Valley Manufacturing, Inc.
P.O. Box 5
East Main Street
Silver Lake, IN 46982
TEL: 219-352-2102; 800-253-8619
FAX: 219-352-2160
E-mail: wvmsales@wabashvalley.com

-OR EQUAL-

For the following site furnishings: TRASH RECEPTACLE, See products.

PART 3 PRODUCTS

3.1 SITE FURNISHINGS

3.1.1 Trash Receptacle

Quantity = 8

The trash receptacle shall measure 30 inches (height) by 24 inches (diameter), and shall be a 32 gallon unit, with a separate and removable plastic liner. The trash receptacle shall also possess a flat top bonnet lid with a hole diameter of 8 inches. The bonnet lid prevents weather elements from entering the trash receptacle. The lid shall come with a heavy-duty aircraft cable that is attached to both the lid and the receptacle, to prevent theft or loss. Materials: The trash receptacle is fabricated of 3/4 inch #9 expanded steel mesh and coated with 1/4 inch of Plastisol ASTM A 755/A 755M-99 coating, heat fused and permanently bonded to the steel; the receptacle and lid framework are fabricated out of 10-gauge and 14-gauge galvanized sheet steel; all mounting hardware shall be stainless steel; the trash receptacle unit shall be inground mounted, with an inground mounting post set 24-1/8 inch into the concrete footing, per manufacturer specifications. Manufacturer Model No. (Wabash Valley Manufacturing): LRD32 (receptacle), RPL32 (plastic liner), 10056 (inground mounting post package) or approved equal.

3.1.2 Bike Rack

Quantity = 1

The bike rack shall be a loop style bike rack mounted inground. Overall height above ground is 39-5/8 inches. Overall width shall be 61-11/16 inches, with 7-3/4 inground mounted. Materials: Bike rack frame shall be made of a 1.6600 inch o.d. by 0.140 inch wall schedule 40 steel pipe.

Manufacturer Model No. (BRP Enterprises): BRP WA1-07-EM(P) or approved equal.

3.2 SITE FURNISHINGS FINISH

The bike rack shall meet or exceed this finish. This process is specified as follows:

- 1) Near white to white metal blast using synthetic silica grit, as specified by the Structural Steel Painting Council (SSPC SP-10 to SP-5) and the National Association of Corrosion Engineers (NACE No. 2 to NACE No. 1) to remove macro-rust, mill scale and exposed surface metal, and to etch the material for maximum powder adhesion.
- 2) Alkali chemical wash to remove micro-rust, grease and oils.
- 3) Fresh water rinse.
- 4) Phosphate treatment to inhibit rust prior to coating.
- 5) Fresh water rinse.
- 6) Non-chrome sealer to create a water break free surface.
- 7) Preheat to eliminate moisture, reduce Faraday cages, and prepare the metal for coating.
- 8) Cool material to enable consistent coating thickness throughout.
- 9) Apply polyester powder base coat to maximize corrosion protection.
- 10) Oven baked to cure powder 50-60% enabling maximum adhesion of the base coat to the metal.
- 11) Apply polyester powder top coat to minimize weathering.

PART 4 EXECUTION

4.1 EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements, accurate locations, and other conditions affecting site furnishings. Proceed with installation only after unsatisfactory conditions have been corrected.

4.2 INSTALLATION

Install site furnishings in the locations identified on the project drawings and shop drawings. Fasten securely to substrates according to manufacturer's written installation instructions.

4.3 ADJUSTING

- 1) Adjust and align to upright position.

- 2) Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.

DIVISION 2 - SITE WORK

SECTION 02922b

SODDING

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SECTION 02922b

SODDING

PART 1 GENERAL

1.1 REFERENCES

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602	(1995a) Agricultural Liming Materials
ASTM D 4972	(1995a) pH of Soils
ASTM D 5268	(1992; R 1996) Topsoil Used for Landscaping Purposes
ASTM D 5883	(1996e1) Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals having a "FIO" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-09 Test Reports

Soil Test;

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified and shall show the application rates for all soil amendments required to achieve a healthy and thriving stand of Kentucky Bluegrass turf. Test methods used and compliance with recognized test standards shall be described. See paragraph 3.1.3 SOIL TEST.

SD-13 Certificates

Sod - FIO;
Topsoil - FIO;
pH Adjuster - FIO;
Fertilizer - FIO;
Organic Material - FIO;
Soil Conditioner - FIO;
Pesticide - FIO;
Pest Management Coordinator - FIO;

Prior to the delivery of materials, provide certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

- a. Sod. Classification, botanical name, common name, mixture percentage of species, percent purity, quality grade, field location and state certification.
- b. pH Adjuster. Calcium carbonate equivalent and sieve analysis.
- c. Fertilizer. Chemical analysis and composition percent.
- d. Organic Material: Composition and source.
- e. Soil Conditioner: Composition and source.
- f. Pesticide. EPA registration number and registered uses.

1.3 SOURCE INSPECTION

The sources of sod material and delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

1.4.1.1 Sod

Sod shall be protected during delivery to prevent desiccation, internal heat buildup, or contamination.

1.4.1.2 Delivered Topsoil

Prior to the delivery of any topsoil, its suitability shall be verified as defined in paragraph 2.2 TOPSOIL. Soil testing and the recommended soil amendments shall be provided and paid for by the Contractor for all topsoil delivered to the site. See paragraph 3.1.4 SOIL TEST.

1.4.1.3 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.4 Pesticides

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the EPA registration number and the manufacturer's registered uses.

1.4.2 Inspection

Sod shall be inspected upon arrival at the job site for conformity to species. Sod shall be checked for visible broadleaf weeds, and a visible consistency with no obvious patches of foreign grasses that exceed 2 percent of the canopy. Sod that is heating up, dry, moldy, yellow, irregularly shaped, torn, or of uneven thickness shall be rejected. Other materials shall be inspected for compliance with specified requirements. Open soil amendment containers or wet soil amendments; topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter; and topsoil that contains viable plants and plant parts, shall be rejected. Unacceptable materials shall be removed from the job site.

1.4.3 Storage

1.4.3.1 Sod

Sod shall be stored in designated areas and kept in a moist condition by watering with a fine mist, and covered with moist burlap, straw, or other covering. Covering shall allow air to circulate, preventing internal heat from building up. Sod shall be protected from exposure to wind and direct sunlight until installed.

1.4.3.2 Other Material Storage

Materials shall be stored in designated areas. Lime and fertilizer shall be stored in cool, dry locations, away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with sod operation materials.

1.4.4 Handling

Sod shall not be damaged during handling. Materials shall not be dropped or dumped from vehicles.

1.4.5 Time Limitation

Time limitation between harvesting and installing sod shall be a maximum 36 hours.

PART 2 PRODUCTS

2.1 SOD

2.1.1 Sod Classification

State-approved nursery-grown sod shall be provided as classified by applicable state laws. Sod section shall be sized to permit rolling and lifting without breaking.

2.1.2 Sod Grass Species

Sod grass species shall be proportioned as follows:

Botanical Name	Common Name	Mixture Percent
_____	_____	_____

Poa pratensis	Kentucky	85% Purity
	Bluegrass	80% Germination
		1.00% Max. Weed Seed

2.1.3 Quality

Sod shall be free of thatch, diseases, nematodes, soil-borne insects, weeds or undesirable plants, stones larger than 1 inch in diameter, woody plant roots, and other materials detrimental to a healthy stand of grass plants. Broadleaf weeds and patches of foreign grasses shall be a maximum 2 percent of the sod section.

2.1.4 Thickness

Sod shall be machine cut to a minimum 1-3/8 inch thickness. Measurement for thickness shall exclude top growth and thatch.

2.1.5 Anchors

Sod anchors shall be as recommended by the sod supplier.

2.1.6 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

2.2 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material, and soil conditioners meeting the following requirements. Vermiculite shall not be used.

2.2.1 pH Adjuster

The pH adjuster shall be an agricultural liming material in accordance with ASTM C 602. These materials may be burnt lime, hydrated lime, ground limestone, or shells. The pH adjuster shall be used to create a favorable soil pH for the plant material specified.

2.2.1.1 Limestone

Limestone material shall contain a minimum calcium carbonate equivalent of 80 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 55 percent shall pass through a No. 60 sieve. To raise soil pH, ground limestone shall be used.

2.2.1.2 Hydrated Lime

Hydrated lime shall contain a minimum calcium carbonate equivalent of 110 percent. Gradation: A minimum 100 percent shall pass through a No. 8 sieve and a minimum 97 percent shall pass through a No. 60 sieve.

2.2.1.3 Burnt Lime

Burnt lime shall contain a minimum calcium carbonate equivalent of 140 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 35 percent shall pass through a No. 60 sieve.

2.2.2 Fertilizer

Fertilizer shall be as recommended by the soil test. Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.2.3 Nitrogen Carrier Fertilizer

Nitrogen Carrier Fertilizer shall be as recommended by the soil test. Nitrogen carrier fertilizer shall be commercial grade, free flowing, and uniform in composition. The fertilizer may be a liquid nitrogen solution.

2.2.4 Organic Material

Organic material shall consist of either bonemeal, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.2.4.1 Bonemeal

Bonemeal shall be finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

2.2.4.2 Rotted Manure

Rotted manure shall be unleached horse, chicken or cattle manure containing a maximum 25 percent by volume straw, sawdust, or other bedding materials. Manure shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and be free of stones, sticks, and soil.

2.2.4.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, yard trimmings, or other wood waste material free of stones, sticks, soil, and toxic substances harmful to plants, fully composted or stabilized with nitrogen.

2.2.4.4 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. Compost shall be derived from food; agricultural or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent or less by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length.

2.2.4.5 Worm Castings

Worm castings shall be screened from worms and food source, and shall be commercially packaged.

2.2.5 Soil Conditioner

Soil conditioner shall be sand, super absorbent polymers, calcined clay, or gypsum for use singly or in combination to meet the requirements for topsoil.

2.2.5.1 Sand

Sand shall be clean and free of toxic materials. Gradation: A minimum 95 percent by weight shall pass a No. 10 sieve and a minimum 10 percent by weight shall pass a No. 16 sieve. Greensand shall be balanced with the inclusion of trace minerals and nutrients.

2.2.5.2 Super Absorbent Polymers

To improve water retention in soils, super absorbent polymers shall be sized and applied according to the manufacturer's recommendations. Polymers shall be added as a soil amendment and be cross-linked polyacrylamide with an absorption capacity of 250-400 times its weight.

2.2.5.3 Calcined Clay

Calcined clay shall be granular particles produced from montmorillonite clay calcined to minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent passing No. 8 sieve; a minimum 99 percent shall be retained on a No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

2.2.5.4 Gypsum

Gypsum shall be commercially packaged, free flowing, and a minimum 95 percent calcium sulfate by volume.

2.2.5.5 Expanded Shale, Clay, or Slate (ESCS)

Rotary kiln produced ESCS material shall be in conformance with ASTM D 5883.

2.3 WATER

Water shall be the responsibility of the Contractor. Water shall not contain elements toxic to plant life.

2.4 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification, a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

PART 3 EXECUTION

3.1 SOD INSTALLATION TIME AND CONDITIONS

3.1.1 Sodding Time

Sod shall be installed from April 1 to Sept. 31, unless authorized by the Contracting Officer. No dry or frozen sod shall be used.

3.1.2 Sodding Conditions

Sodding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the sodding operations, proposed alternate times shall be submitted for approval.

3.1.3 Soil Test

Delivered topsoil, existing soil in smooth graded areas, and stripped stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection on site shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the sod species specified.

3.2 SITE PREPARATION

3.2.1 Finished Grade and Topsoil

Prior to the commencement of the sodding operation, the Contractor shall verify that finished grades are as indicated on drawings; the placing of topsoil, smooth grading, and compaction requirements have been completed in accordance with Section 02300b EARTHWORK.

3.2.2 Application of Soil Amendments

3.2.2.1 Applying pH Adjuster

The pH adjuster shall be applied at the rate recommended by the soil test. The pH adjuster shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage operation.

3.2.2.2 Applying Fertilizer

The fertilizer shall be applied at the rate recommended by the soil test. Fertilizer shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage or hydroseeding operation.

3.2.2.3 Applying Soil Conditioner

The soil conditioner shall be as recommended by the soil test. The soil conditioner shall be spread uniformly over the soil a minimum 1 inch depth

and thoroughly incorporated by tillage into the soil to a maximum 4 inches depth.

3.2.2.4 Applying Super Absorbent Polymers

Polymers shall be spread uniformly over the soil as recommended by the manufacturer and thoroughly incorporated by tillage into the soil to a maximum 2 inches deep prior to placement of sod.

3.2.3 Tillage

Soil on slopes up to a maximum 3-horizontal-to-1-vertical shall be tilled to a minimum 4 inches deep. On slopes between 3-horizontal-to-1-vertical and 1-horizontal-to-1 vertical, the soil shall be tilled to a minimum 2 inches deep by scarifying with heavy rakes, or other method. Rototillers shall be used where soil conditions and length of slope permit. On slopes 1-horizontal-to-1 vertical and steeper, no tillage is required. Drainage patterns shall be maintained as indicated on drawings. Areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of surface erosion or grade deficiencies shall conform to topsoil requirements. The pH adjuster, fertilizer, and soil conditioner may be applied during this procedure.

3.2.4 Prepared Surface

3.2.4.1 Preparation

The prepared surface shall be a maximum 1 inch below the adjoining grade of any surfaced area. New surfaces shall be blended to existing areas. The prepared surface shall be rolled and completed with a light raking to remove from the surface debris and stones over a minimum 5/8 inch in any dimension.

3.2.4.2 Protection

Areas within the prepared surface shall be protected from compaction or damage by vehicular or pedestrian traffic and surface erosion.

3.3 INSTALLATION

Prior to installing sod, any previously prepared surface compacted or damaged shall be reworked to meet the requirements of paragraph SITE PREPARATION. Areas shall be sodded as indicated. Adequate soil moisture shall be ensured prior to sodding by spraying water on the area to be sodded and wetting the soil to a maximum 1 inch depth.

3.3.1 Installing Sod

Rows of sod sections shall be placed parallel to and tightly against each other. Joints shall be staggered laterally. The sod sections shall not be stretched or overlapped. All joints shall be butted tight. Voids and air drying of roots shall be prevented. Sod sections shall be laid across the slope on long slopes. Sod sections shall be laid at right angles to the flow of water in ditches. Sod sections shall be anchored on slopes steeper than 3-horizontal-to-1-vertical. Anchoring may be required when surface weight or pressure upon placed sod sections is anticipated to cause lateral movement. Sod anchors shall be placed a minimum 2 feet on center with a minimum 2 anchors per sod section.

3.3.2 Finishing

Displacement of the sod shall be prevented by tamping or rolling the sod in place and knitting the sod to the soil. Air pockets shall be eliminated and a true and even surface shall be provided. Frayed edges shall be trimmed, and holes or missing corners shall be patched with sod.

3.3.3 Rolling

The entire area shall be firmed with a roller not exceeding 90 pounds per foot roller width. Slopes over a maximum 3-horizontal-to-1 vertical shall not be rolled.

3.3.4 Watering Sod

Watering shall be started immediately after completing each day of installing sod. Water shall be applied at least 3 times per week to supplement rainfall, at a rate sufficient to ensure moist soil conditions to a minimum depth of 1 inch. Run-off, puddling, and wilting shall be prevented. Unless otherwise directed, watering trucks shall not be driven over turf areas. Watering of other adjacent areas or plant material shall be prevented.

3.4 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program.

3.4.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.4.2 Application

A state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.5 RESTORATION AND CLEAN UP

3.5.1 Restoration

Existing turf areas, pavements, and facilities that have been damaged from the sodding operation shall be restored to original condition at Contractor's expense.

3.5.2 Clean Up

Excess and waste material shall be removed from the sodded areas and shall be disposed offsite. Adjacent paved areas shall be cleaned.

3.6 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the sodding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed.

DIVISION 2 - SITE WORK

SECTION 02930b

EXTERIOR PLANTING

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SECTION 02930b

EXTERIOR PLANTING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)

ANLA Z60.1 (1996) Nursery Stock

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A300 (1995) Tree Care Operations - Trees, Shrubs and other Woody Plant Maintenance

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 602 (1995a) Agricultural Liming Materials

ASTM D 4972 (1995a) pH of Soils

ASTM D 5034 (1995) Breaking Strength and Elongation of Textile Fabrics (Grab Test)

ASTM D 5035 (1995) Breaking Force and Elongation of Textile Fabrics (Strip Method)

ASTM D 5268 (1992; R 1996) Topsoil Used for Landscaping Purposes

ASTM D 5883 (1996el) Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-01 Product Data

Geotextile;
Chemical Treatment Material;

Manufacturer's literature including physical characteristics, application and installation instructions for geotextile and chemical treatment material.

Application of Pesticide;

Pesticide treatment plan with sequence of treatment work with dates and times. The pesticide trade name, EPA registration number, chemical composition, formulation, concentration of original and diluted material, application rate of active ingredients, method of application, area treated, amount applied; and the name and state license number of the state certified applicator shall be included.

SD-04 Shop Drawings

Shop Drawings; FIO

Topsoil and Underground Utilities

Location of underground utilities and facilities; and availability of topsoil from the stripping and stock piling operation.

SD-09 Test Reports

Soil Test; FIO

Percolation Test; FIO

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-13 Certificates

Plant Material; FIO

Topsoil; FIO

pH Adjuster; FIO

Fertilizer; FIO

Organic Material; FIO

Soil Conditioner; FIO

Organic Mulch; FIO

Mycorrhizal Fungi Inoculum; FIO

Pesticide; FIO

Prior to delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following.

a. Plant Material: Classification, botanical name, common name, size, quantity by species, and location where grown.

b. Topsoil: Particle size, pH, organic matter content, textural class, soluble salts, chemical and mechanical analyses.

- c. pH Adjuster: Sieve analysis and calcium carbonate equivalent.
- d. Fertilizer: Chemical analysis and composition percent.
- e. Organic Material: Composition and source.
- f. Soil Conditioner: Composition and source.
- g. Organic Mulch: Composition, source, and treatment against fungi growth.
- h. Mycorrhizal Fungi Inoculum: Plant material treated.
- i. Pesticide. EPA registration number and registered uses.

SD-14 Samples

SD-19 Operation and Maintenance Data

Maintenance Instructions;

Instruction for year-round care of installed plant material.

1.3 SOURCE INSPECTIONS

The nursery or source of plant material and the source of delivered topsoil shall be subject to inspection.

1.4 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.4.1 Delivery

1.4.1.1 Plant Material Identification

Plant material shall be identified with attached, durable, waterproof labels and weather-resistant ink, stating the correct botanical plant name and size.

1.4.1.2 Protection During Delivery

Plant material shall be protected during delivery to prevent desiccation and damage to the branches, trunk, root system, or earth ball. Branches shall be protected by tying-in. Exposed branches shall be covered during transport.

1.4.1.3 Delivered Topsoil

Prior to the delivery of any topsoil, the availability of topsoil shall be verified in paragraph TOPSOIL. A soil test shall be provided for delivered topsoil.

1.4.1.4 Soil Amendments

Soil amendments shall be delivered to the site in the original, unopened containers bearing the manufacturer's chemical analysis. In lieu of

containers, soil amendments may be furnished in bulk. A chemical analysis shall be provided for bulk deliveries.

1.4.1.5 Pesticide Material

Pesticide material shall be delivered to the site in the original, unopened containers bearing legible labels indicating the Environmental Protection Agency (EPA) registration number and the manufacturer's registered uses.

1.4.2 Inspection

Plant material shall be well shaped, vigorous and healthy with a healthy, well branched root system, free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement or abrasion. Plant material shall be checked for unauthorized substitution and to establish nursery grown status. Plant material showing desiccation, abrasion, sun-scald injury, disfigurement, or unauthorized substitution shall be rejected. The plant material shall exhibit typical form of branch to height ratio; and meet the caliper and height measurements specified. Plant material that measures less than specified, or has been poled, topped off or headed back, shall be rejected. Container-grown plant material shall show new fibrous roots and the root mass shall contain its shape when removed from the container. Plant material with broken or cracked balls; or broken containers shall be rejected. Bare-root plant material that is not dormant or is showing roots were pulled from the ground shall be rejected. Other materials shall be inspected for compliance with paragraph PRODUCTS. Open soil amendment containers or wet soil amendments shall be rejected. Topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material larger than 1-1/2 inch diameter shall be rejected. Topsoil that contains viable plant material and plant parts shall be rejected. Unacceptable material shall be removed from the job site.

1.4.3 Storage

1.4.3.1 Plant Material Storage

Plant material not installed on the day of arrival at the site shall be stored and protected in designated areas. Plant material shall not be stored longer than 30 days. Plant material shall be protected from direct exposure to wind and sun. All plant material shall be kept in a moist condition by watering with a fine mist spray until installed.

1.4.3.2 Other Material Storage

Storage of other material shall be in designated areas. Soil amendments shall be stored in dry locations and away from contaminants. Chemical treatment material shall be stored according to manufacturer's instructions and not with planting operation material.

1.4.4 Handling

Plant material shall not be injured in handling. Cracking or breaking the earth ball of balled and burlapped plant material shall be avoided. Plant material shall not be handled by the trunk or stems. Materials shall not be dropped from vehicles.

1.4.5 Time Limitation

Except for container-grown plant material, the time limitation from digging to installing plant material shall be a maximum 90 days. The time limitation between installing the plant material and placing the mulch shall be a maximum 24 hours.

1.5 WARRANTY

Furnished plant material shall have a warranty for plant growth to be in a vigorous growing condition for a minimum 12 month period. A minimum 12 month calendar time period for the warranty of plant growth shall be provided regardless of the contract time period. When plant material is determined to be unhealthy in accordance with paragraph 3.9.1 UNHEALTHY PLANT MATERIAL, it shall be replaced once under this warranty.

PART 2 PRODUCTS

2.1 PLANT MATERIAL

2.1.1 Plant Material Classification

The plant material shall be nursery grown stock conforming to ANLA Z60.1 and shall be the species specified.

2.1.2 Plant Schedule

The plant schedule shall provide botanical names as included in one or more of the publications listed under "Nomenclature" in ANLA Z60.1.

2.1.3 Substitutions

Substitutions will not be permitted without written request and approval from the Contracting Officer.

2.1.4 Quality

Well shaped, well grown, vigorous plant material having healthy and well branched root systems in accordance with ANLA Z60.1 shall be provided. Plant material shall be provided free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement and abrasion. Plant material shall be free of shock or damage to branches, trunk, or root systems, which may occur from the digging and preparation for shipment, method of shipment, or shipment. Plant quality is determined by the growing conditions; method of shipment to maintain health of the root system; and growth of the trunk and crown as follows.

2.1.5 Growing Conditions

Plant material shall be native to or well-suited to the growing conditions of the project site. Plant material shall be grown under climatic conditions similar to those at the project site.

2.1.6 Method of Shipment to Maintain Health of Root System

2.1.6.1 Balled and Burlapped (BB) Plant Material

Ball size and ratio shall be in accordance with ANLA Z60.1. The ball shall be of a diameter and depth to encompass enough fibrous and feeding root system necessary for the full recovery of the plant. The plant stem or trunk shall be centered in the ball. All roots shall be clean cut at the ball surface. Roots shall not be pulled from the ground. Before shipment the root ball shall be dipped in gels containing mycorrhizal fungi inoculum. The root ball shall be completely wrapped with burlap or other suitable material and securely laced with biodegradable twine.

2.1.6.2 Container-Grown (C) Plant Material

Container size shall be in accordance with ANLA Z60.1. Plant material shall be grown in a container over a duration of time for new fibrous roots to have developed and for the root mass to retain its shape and hold together when removed from the container. Container-grown plant material shall be inoculated with mycorrhizal fungi during germination in the nursery. Before shipment the root system shall be dipped in gels containing mycorrhizal fungi inoculum. The container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.

2.1.7 Growth of Trunk and Crown

2.1.7.1 Deciduous Trees

A height to caliper relationship shall be provided in accordance with ANLA Z60.1. Height of branching shall bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

- a. Specimen: The tree provided shall be well branched and pruned naturally according to the species. The form of growth desired, which may not be in accordance with natural growth habit, shall be as indicated.

2.1.7.2 Deciduous Shrubs

Deciduous shrubs shall have the height and number of primary stems recommended by ANLA Z60.1. Acceptable plant material shall be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

2.1.7.3 Coniferous Evergreen Plant Material

Coniferous Evergreen plant material shall have the height-to-spread ratio recommended by ANLA Z60.1. The coniferous evergreen trees shall not be "poled" or the leader removed. Acceptable plant material shall be exceptionally heavy, well shaped and trimmed to form a symmetrical and tightly knit plant. The form of growth desired shall be as indicated.

2.1.8 Plant Material Size

Plant material shall be furnished in sizes indicated. Plant material larger in size than specified may be provided at no additional cost to the Government.

2.1.9 Plant Material Measurement

Plant material measurements shall be in accordance with ANLA Z60.1.

2.2 TOPSOIL

Topsoil shall be as defined in ASTM D 5268. When available, the topsoil shall be the existing surface soil stripped and stockpiled onsite in accordance with Section 02300b EARTHWORK. When additional topsoil is required beyond the available topsoil from the stripping operation, topsoil shall be delivered and amended as recommended by the soil test for the plant material specified. Topsoil shall be free from slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter. Topsoil shall be free from viable plants and plant parts.

2.3 SOIL AMENDMENTS

Soil amendments shall consist of pH adjuster, fertilizer, organic material and soil conditioners meeting the following requirements. Vermiculite is not recommended.

2.3.1 pH Adjuster

The pH adjuster shall be an agricultural liming material in accordance with ASTM C 602. These materials may be burnt lime, hydrated lime, ground limestone, or shells. The pH adjuster shall be used to create a favorable soil pH for the plant material specified.

2.3.1.1 Limestone

Limestone material shall contain a minimum calcium carbonate equivalent of 80 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 55 percent shall pass through a No. 60 sieve. To raise soil pH, ground limestone shall be used.

2.3.1.2 Hydrated Lime

Hydrated lime shall contain a minimum calcium carbonate equivalent of 110 percent. Gradation: A minimum 100 percent shall pass through a No. 8 sieve and a minimum 97 percent shall pass through a No. 60 sieve.

2.3.1.3 Burnt Lime

Burnt lime shall contain a minimum calcium carbonate equivalent of 140 percent. Gradation: A minimum 95 percent shall pass through a No. 8 sieve and a minimum 35 percent shall pass through a No. 60 sieve.

2.3.2 Fertilizer

It shall be as recommended by the soil test. Fertilizer shall be controlled release commercial grade; free flowing, pellet or tablet form; uniform in

composition; and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.3.3 Organic Material

Organic material shall consist of either bonemeal, peat, rotted manure, decomposed wood derivatives, recycled compost, or worm castings.

2.3.3.1 Bonemeal

Bonemeal shall be a finely ground, steamed bone product containing from 2 to 4 percent nitrogen and 16 to 40 percent phosphoric acid.

2.3.3.2 Rotted Manure

Rotted manure shall be unleached horse, chicken, or cattle manure containing a maximum 25 percent by volume of straw, sawdust, or other bedding materials. Manure shall contain no chemicals or ingredients harmful to plants. The manure shall be heat treated to kill weed seeds and shall be free of stones, sticks, and soil.

2.3.3.3 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark, sawdust, or other wood waste material free of stones, sticks, and toxic substances harmful to plants, and stabilized with nitrogen.

2.3.3.4 Recycled Compost

Compost shall be a well decomposed, stable, weed free organic matter source. It shall be derived from food, agricultural, or industrial residuals; biosolids (treated sewage sludge); yard trimmings; or source-separated or mixed solid waste. The compost shall possess no objectionable odors and shall not resemble the raw material from which it was derived. The material shall not contain substances toxic to plants. Gradation: The compost material shall pass through a 3/8 inch screen, possess a pH of 5.5 to 8.0, and have a moisture content between 35-55 percent by weight. The material shall not contain more than 1 percent or less by weight of man-made foreign matter. Compost shall be cleaned of plastic materials larger than 2 inches in length.

2.3.3.5 Worm Castings

Worm castings shall be screened from worms and food source and shall be commercially packaged.

2.3.4 Soil Conditioner

Soil conditioner shall be sand, super absorbent polymers, calcined clay, or gypsum for single use or in combination to meet topsoil requirements for the plant material specified.

2.3.4.1 Sand

Sand shall be clean and free of toxic materials. Gradation: A minimum 95 percent by weight shall pass a No. 10 sieve and a minimum 10 percent by weight shall pass a No. 16 sieve. Greensand shall be balanced with the inclusion of trace minerals and nutrients.

2.3.4.2 Super Absorbent Polymers

To improve water retention in soils, super absorbent polymers shall be sized according to manufacturer's recommendations. Polymers shall be added as a soil amendment and be cross-linked polyacrylamide with an absorption capacity of 250-400 times its weight.

2.3.4.3 Calcined Clay

Granular particles shall be produced from montmorillonite clay calcined to minimum temperature of 1200 degrees F. Gradation: A minimum 90 percent passing No. 8 sieve; a minimum 99 percent shall be retained on No. 60 sieve; and a maximum 2 percent shall pass a No. 100 sieve. Bulk density: A maximum 40 pounds per cubic foot.

2.3.4.4 Gypsum

Gypsum shall be commercially packaged, free flowing, and a minimum 95 percent calcium sulfate by volume.

2.3.4.5 Expanded Shale, Clay, or Slate (ESCS)

Rotary kiln produced ESCS material shall be in conformance with ASTM D 5883.

2.4 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region. Rotted manure is not recommended to be used as a mulch because it would encourage surface rooting of the plant material and weeds.

2.4.1 Organic Mulch

Organic mulch materials shall be native to the project site and consist of recycled mulch, shredded bark, wood chips, or ground bark.

2.4.1.1 Recycled Mulch

Recycled mulch may include compost, tree trimmings, or pine needles with a gradation that passes through a 2-1/2 x 2-1/2 inch screen. It shall be cleaned of all sticks a minimum 1 inch in diameter and plastic materials a minimum 3 inch length. The material shall be treated to retard the growth of mold and fungi. Other recycled mulch may include peanut shells, pecan shells or coco bean shells.

2.4.1.2 Shredded Pine Bark

Locally shredded material shall be treated to retard the growth of mold and fungi.

2.5 GEOTEXTILE

Geotextile shall be woven or nonwoven; polypropylene, polyester, or fiberglass, mat in accordance with ASTM D 5034 or ASTM D 5035. It shall be made specifically for use as a fabric around plant material. Nominal weight shall be a minimum 4 ounces per square yard. Permeability rate shall be a minimum 0.04 inch per second.

2.6 WOOD STAKING MATERIAL

Wood stakes shall be hardwood or fir; rough sawn; free from knots, rot, cross grain, or other defects that would impair their strength.

2.6.1 Wood Ground Stakes

Wood ground stakes shall be a minimum of 2 x 2 inch square and a minimum 3 feet long with a point at one end.

2.7 METAL STAKING AND GUYING MATERIAL

Metal shall be aluminum or steel consisting of recycled content made for holding plant material in place.

2.7.1 Metal Ground Stakes

Metal ground stakes shall be a minimum 1/2 inch diameter and a minimum 3 feet long.

2.7.2 Earth Anchor

Metal earth anchors shall be a minimum 1/2 inch diameter and a minimum 2 feet long.

2.7.3 Guying Material

Metal guying material shall be a minimum 12 gauge wire. Multi-strand cable shall be woven wire. Guying material tensile strength shall conform to the size of tree to be held firmly in place.

2.7.4 Turnbuckle

Metal turnbuckles shall be galvanized or cadmium-plated steel, and shall be a minimum 3 inches long with closed screw eyes on each end. Screw thread tensile strength shall conform to the size of tree to be held firmly in place.

2.8 PLASTIC STAKING AND GUYING MATERIAL

Plastic shall consist of recycled plastic product made for holding plant material firmly in place. Plastic shall not be used for deadmen.

2.8.1 Plastic Ground Stakes

Plastic ground stakes shall be a minimum 1 inch diameter and a minimum 3 feet long.

2.8.2 Plastic Guying Material

Plastic guying material shall be designed specifically for the purpose of firmly holding plant material in high wind velocities.

2.8.3 Chafing Guard

Plastic chafing guards shall be used to protect tree trunks and branches when metal is used as guying material. The material shall be the same color throughout the project site. Length shall be a minimum 1.5 times the circumference of the plant trunk at its base.

2.9 RUBBER GUYING MATERIAL

Rubber chafing guards, consisting of recycled material, shall be used to protect tree trunks and branches when metal guying material is applied. The material shall be the same color throughout the project. Length shall be a minimum 1.5 times the circumference of the plant trunk at its base.

2.10 FLAG

Plastic flag material shall be used on guying material. It shall be a minimum 6 inches long. Tape color shall be consistent and visually complimentary to the entire project area. The tape color shall meet pedestrian visual safety requirements for day and night.

2.11 MYCORRHIZAL FUNGI INOCULUM

Mycorrhizal fungi inoculum shall be composed of multiple-fungus inoculum as recommended by the manufacturer for the plant material specified.

2.12 WATER

Unless otherwise directed, water shall be the responsibility of the Contractor. Water shall not contain elements toxic to plant life.

2.13 PESTICIDE

Pesticide shall be insecticide, herbicide, fungicide, nematocide, rodenticide or miticide. For the purpose of this specification a soil fumigant shall have the same requirements as a pesticide. The pesticide material shall be EPA registered and approved.

PART 3 EXECUTION

3.1 INSTALLING PLANT MATERIAL TIME AND CONDITIONS

3.1.1 Deciduous Plant Material Time

Deciduous plant material shall be installed from June 1 to April 1.

3.1.2 Evergreen Plant Material Time

There are no calendar installation restrictions for evergreen plant material.

3.1.3 Plant Material Conditions

Planting operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, frozen ground or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted for approval.

3.1.4 Tests

3.1.4.1 Percolation Test

Test for percolation shall be done to determine positive drainage of plant pits and beds. A positive percolation shall consist of a minimum 1 inch per 3 hours; when a negative percolation test occurs, a shop drawing shall be submitted indicating the corrective measures.

3.1.4.2 Soil Test

Delivered topsoil, excavated plant pit soil, and stockpiled topsoil shall be tested in accordance with ASTM D 5268 and ASTM D 4972 for determining the particle size, pH, organic matter content, textural class, chemical analysis, soluble salts analysis, and mechanical analysis. Sample collection onsite shall be random over the entire site. Sample collection for stockpiled topsoil shall be at different levels in the stockpile. The soil shall be free from debris, noxious weeds, toxic substances, or other materials harmful to plant growth. The test shall determine the quantities and type of soil amendments required to meet local growing conditions for the plant material specified.

3.2 SITE PREPARATION

3.2.1 Layout

Plant material locations and bed outlines shall be staked on the project site before any excavation is made. Plant material locations may be adjusted to meet field conditions.

3.2.2 Protecting Existing Vegetation

When there are established lawns in the planting area, the turf shall be covered and/or protected during planting operations. Existing trees, shrubs, and plant beds that are to be preserved shall be barricaded along the dripline to protect them during planting operations.

3.3 EXCAVATION

3.3.1 Obstructions Below Ground

When obstructions below ground affect the work, shop drawings showing proposed adjustments to plant material location, type of plant and planting method shall be submitted for approval.

3.3.2 Turf Removal

Where the planting operation occurs in an existing lawn area, the turf shall be removed from the excavation area to a depth that will ensure the removal of the entire root system.

3.3.3 Plant Pits

Plant pits for ball and burlapped or container plant material shall be dug to a depth equal to the height of the root ball as measured from the base of the ball to the base of the plant trunk. Plant pits for bare-root plant material shall be dug to a depth equal to the height of the root system. Plant pits shall be dug a minimum 50 percent wider than the ball or root system to allow for root expansion. The pit shall be constructed with sides sloping towards the base as a cone, to encourage well aerated soil to be available to the root system for favorable root growth. Cylindrical pits with vertical sides shall not be used.

3.4 INSTALLATION

3.4.1 Setting Plant Material

Plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. In relation to the surrounding grade, the plant material shall be set even with the grade at which it was grown.

3.4.2 Backfill Soil Mixture

The backfill soil mixture may be a mix of topsoil and soil amendments suitable for the plant material specified. When practical, the excavated soil from the plant pit that is not amended provides the best backfill and shall be used.

3.4.3 Adding Mycorrhizal Fungi Inoculum

Mycorrhizal fungi inoculum shall be added as recommended by the manufacturer for the plant material specified.

3.4.4 Backfill Procedure

Prior to backfilling, all metal, wood, synthetic products, or treated burlap devices shall be removed from the ball or root system avoiding damage to the root system. The backfill procedure shall remove air pockets from around the root system. Additional requirements are as follows.

3.4.4.1 Balled and Burlapped Plant Material

Biodegradable burlap and tying material shall be carefully opened and folded back from the top a minimum 1/3 depth from the top of the root ball. Backfill mixture shall be added to the plant pit in 6 inch layers with each layer tamped.

3.4.4.2 Container-Grown Plant Material

The plant material shall be carefully removed from containers that are not biodegradeable. Prior to setting the plant in the pit, a maximum 1/4 depth

of the root mass, measured from the bottom, shall be spread apart to promote new root growth. For plant material in biodegradable containers the container shall be split prior to setting the plant with container. Backfill mixture shall be added to the plant pit in 6 inch layers with each layer tamped.

3.4.4.3 Earth Berm

An earth berm, consisting of backfill soil mixture, shall be formed with a minimum 4 inch height around the edge of the plant pit to aid in water retention and to provide soil for settling adjustments.

3.4.5 Plant Bed

Plant material shall be set in plant beds according to the drawings. Backfill soil mixture shall be placed on previously scarified subsoil to completely surround the root balls, and shall be brought to a smooth and even surface, blending to existing areas. Earth berms shall be provided. Polymers shall be spread uniformly over the plant bed and in the planting pit as recommended by the manufacturer and thoroughly incorporated into the soil to a maximum 4 inch depth.

3.4.6 Watering

Plant pits and plant beds shall be watered immediately after backfilling, until completely saturated.

3.4.7 Staking and Guying

Staking will be required when trees are unstable or will not remain set due to their size, shape, or exposure to high wind velocity.

3.4.7.1 Three Ground Stakes

Trees over a minimum 8 feet height and less than a maximum 6 inch caliper shall be held firmly in place with 3 bracing or ground stakes spaced equidistantly around the tree. Ground stakes shall be avoided in areas to be mowed. Stakes shall be driven into firm ground outside the earth berm. The guying material shall be firmly anchored at a minimum 1/2 tree height and shall prevent girdling. For trees over maximum 3 inch diameter at breast height, turnbuckles shall be used on the guying material for tree straightening purposes. One turnbuckle shall be centered on each guy line. Chafing guards shall be used when metal is the guying material.

3.4.8 Flags

A flag shall be securely fastened to each guy line equidistant between the tree and the stake, deadmen, or earth anchor. The flag shall be visible to pedestrians.

3.5 FINISHING

3.5.1 Plant Material

Prior to placing mulch, the installed area shall be uniformly edged to provide a clear division line between the planted area and the adjacent turf

area, shaped as indicated. The installed area shall be raked and smoothed while maintaining the earth berms.

3.5.2 Weed Barrier Placement Within Shrub Beds

A 6 mil black plastic membrane shall be placed within the shrub bed areas defined on the drawings. The membrane shall completely cover all ground surfaces beneath the pine bark mulch. The areas beneath the membrane shall first be treated with Round-Up herbicide (or approved equal), followed with a granular, long-acting pre-emergent herbicide.

3.5.3 Pine Bark Mulch Placement

The placement of pine bark mulch shall occur a maximum 48 hours after planting. Pine bark mulch, used to reduce soil water loss, regulate soil temperature and prevent weed growth, shall be spread to cover the installed area with a minimum 4 inch uniform thickness. The mulch shall be kept out of the crowns of shrubs and ground cover and shall be kept off buildings, sidewalks and other facilities.

3.5.4 Pruning

Pruning shall be accomplished by trained and experienced personnel. The pruning of trees and palms shall be in accordance with ANSI A300. Only dead or broken material shall be pruned from installed plants. The typical growth habit of individual plant material shall be retained. Clean cuts shall be made flush with the parent trunk. Improper cuts, stubs, dead and broken branches shall be removed. "Headback" cuts at right angles to the line of growth will not be permitted. Trees shall not be poled or the leader removed, nor shall the leader be pruned or "topped off".

3.6 MAINTENANCE DURING PLANTING OPERATION

Installed plant material shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed to prevent desiccation. Installed areas shall be kept free of weeds, grass, and other undesired vegetation. The maintenance includes maintaining the mulch, watering, and adjusting settling.

3.7 APPLICATION OF PESTICIDE

When application of a pesticide becomes necessary to remove a pest or disease, a pesticide treatment plan shall be submitted and coordinated with the installation pest management program.

3.7.1 Technical Representative

The certified installation pest management coordinator shall be the technical representative, and shall be present at all meetings concerning treatment measures for pest or disease control. They may be present during treatment application.

3.7.2 Application

Only a state certified applicator shall apply required pesticides in accordance with EPA label restrictions and recommendations. Clothing and personal protective equipment shall be used as specified on the pesticide

label. A closed system is recommended as it prevents the pesticide from coming into contact with the applicator or other persons. Water for formulating shall only come from designated locations. Filling hoses shall be fitted with a backflow preventer meeting local plumbing codes or standards. Overflow shall be prevented during the filling operation. Prior to each day of use, the equipment used for applying pesticide shall be inspected for leaks, clogging, wear, or damage. Any repairs are to be performed immediately.

3.8 RESTORATION AND CLEAN UP

3.8.1 Restoration

Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at the Contractor's expense.

3.8.2 Clean Up

Excess and waste material shall be removed from the installed area and shall be disposed offsite. Adjacent paved areas shall be cleared.

3.9 PLANT ESTABLISHMENT

3.9.1 Unhealthy Plant Material

A tree shall be considered unhealthy or dead when the main leader has died back, or up to a maximum 25 percent of the crown has died. A shrub shall be considered unhealthy or dead when up to a maximum 25 percent of the plant has died. This condition shall be determined by scraping on a branch an area 1/16-inch square, maximum, to determine if there is a green cambium layer below the bark. The Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be removed immediately and shall be replaced as soon as seasonal conditions permit.

3.9.2 Replacement Plant Material

Unless otherwise directed, plant material shall be provided for replacement in accordance with paragraph PLANT MATERIAL. Replacement plant material shall be installed in accordance with paragraph INSTALLATION, and recommendations in paragraph PLANT ESTABLISHMENT PERIOD. Plant material shall be replaced in accordance with paragraph WARRANTY. An extended plant establishment period shall not be required for replacement plant material.

DIVISION 3 - CONCRETE

SECTION 03100b

STRUCTURAL CONCRETE FORMWORK

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SECTION 03100b

STRUCTURAL CONCRETE FORMWORK

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 347R (1994) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA ANSI/AHA A135.4 (1995) Basic Hardboard

DEPARTMENT OF COMMERCE (DOC)

DOC PS 1 (1996) Voluntary Product Standard -
Construction and Industrial Plywood

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-01 Data

Form Materials; FIO.

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

SD-06 Instructions

Form Releasing Agents; FIO.

Manufacturer's recommendation on method and rate of application of form releasing agents.

1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03300b CAST-IN-PLACE STRUCTURAL CONCRETE. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

2 PRODUCTS

2.1 FORM MATERIALS

2.1.1 Forms For Class A and Class B Finish

Forms for Class A and Class B finished surfaces shall be plywood panels conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels. Forms for round columns shall be the prefabricated seamless type. Exposed surfaces in river access area and pedestrian walkway shall receive a Class B finish.

2.1.2 Forms For Class C Finish

Forms for Class C finished surfaces shall be shiplap lumber; plywood conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II; tempered concrete form hardboard conforming to AHA ANSI/AHA A135.4; other approved concrete form material; or steel, except that steel lining on wood sheathing shall not be used. Forms for round columns may have one vertical seam.

2.1.3 Forms For Class D Finish

Forms for Class D finished surfaces, except where concrete is placed against earth, shall be wood or steel or other approved concrete form material.

2.1.4 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter.

2.1.5 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

3 EXECUTION

3.1 FORMWORK INSTALLATION

3.1.1 General

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03300b CAST-IN-PLACE STRUCTURAL CONCRETE and conforming to construction tolerance given in TABLE 1. Where concrete surfaces are to

have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, the forms shall fit over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse. Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker.

3.1.2 Curb and Gutter

a. Forms: Forms for curb and gutter shall be carefully set to alignment and grade to conform to the dimensions of the curb. Forms shall be held rigidly in place by use of stakes placed at intervals not to exceed 4 feet. Clamps, spreaders, and braces shall be used where required to insure rigidity in the forms. The forms on the front of the curb and gutter shall be removed not less than 2 hours nor more than 6 hours after the concrete has been placed. The back forms of the curb shall remain in place until the the face and and top of curb have been finished as specified for finishing. Curb and gutter forms shall not be removed while the concrete is sufficiently plastic to slump in any direction. Forms shall be cleaned and coated with form oil each time before concrete is placed. Wood forms may be thoroughly wetted with water instead of form oil before concrete is placed, except that when probable freezing temperature, oiling is mandatory.

b. Curb-forming Machines: Curb-forming machines for constructing curb and gutters will be approved based on trial use on the job. Use of the equipment will be discontinued at any time during construction if the equipment produces unsatisfactory results, and the work shall be as specified above. Unsatisfactory work shall be removed and reconstructed for the full length between regularly scheduled joints. removed portions shall be disposed of as directed.

3.2 CHAMFERING

Except as otherwise shown, external corners that will be exposed shall be chamfered usually above ground only, beveled (1/2"), by moldings placed in the forms.

3.3 COATING

Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for Class C and D finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures, coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.4 REMOVAL OF FORMS

Forms shall be removed preventing injury to the concrete and ensuring the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the

removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. Supporting forms or shores shall not be removed before the concrete strength has reached 70 percent of design strength, as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

TABLE 1

TOLERANCES FOR FORMED SURFACES

1. Variations from the plumb:	In any 10 feet of length ----- 1/4 inch
a. In the lines and surfaces of columns and walls	Maximum for entire length ----- 1 inch
b. For exposed corner columns, control-joint grooves, and other conspicuous lines	In any 20 feet of length ----- 1/4 inch Maximum for entire length----- 1/2 inch
2. Variation from the level or from the grades indicated on the drawings:	In any 10 feet of length -----1/4 inch In any bay or in any 20 feet of length----- 3/8 inch
a. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines	In any bay or in any 20 feet of length ----- 1/4 inch Maximum for entire length----- 1/2 inch
3. Variation of the linear building lines from established position in plan	In any 20 feet ----- 1/2 inch Maximum -----1 inch
4. Variation of distance between walls, columns, partitions	1/4 inch per 10 feet of distance, but not more than 1/2 inch in any one bay, and not more than 1 inch total variation
5. Variation in the sizes and locations of sleeves, floor openings, and wall opening	Minus ----- 1/4 inch Plus ----- 1/2 inch

6. Variation in cross-sectional dimensions of beams and in the thickness of slabs and walls
- Minus ----- 1/4 inch
Plus ----- 1/2 inch
7. Footings:
- a. Variation of dimensions in plan
- Minus ----- 1/2 inch
Plus ----- 2 inches
when formed or plus 3 inches
when placed against unformed
excavation
- b. Misplacement of eccentricity
- 2 percent of the footing
width in the direction of
misplacement but not more than
2 inches
- c. Reduction in thickness of specified thickness
- Minus ----- 5 percent

DIVISION 3 - CONCRETE

SECTION 03150b

EXPANSION JOINTS AND CONTRACTION JOINTS

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SECTION 03150b

EXPANSION JOINTS AND CONTRACTION JOINTS

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA ANSI/AHA A135.4 (1995) Basic Hardboard

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 920 (1995) Elastomeric Joint Sealants

ASTM D 1190 (1996) Concrete Joint Sealer, Hot-Applied Elastic Type

ASTM D 1191 (1984; R 1994) Test Methods for Concrete Joint Sealers

ASTM D 1751 (1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D 2628 (1991) Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

ASTM D 5249 (1995) Backer Material for Use With Cold and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

CORPS OF ENGINEERS (COE)

COE CRD-C 513 (1974) Corps of Engineers Specifications for Rubber Waterstops

COE CRD-C 572 (1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The

following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-01 Data

Preformed Expansion Joint Filler; FIO. Sealant; FIO. Waterstops; FIO.

Manufacturer's literature, including safety data sheets, for preformed fillers and the lubricants used in their installation; field-molded sealants and primers (when required by sealant manufacturer); preformed compression seals; and waterstops.

SD-13 Certificates

Preformed Expansion Joint Filler; FIO. Sealant; FIO. Waterstops; FIO.

Certificates of compliance stating that the joint filler and sealant materials and waterstops conform to the requirements specified.

1.3 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected from moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

2 PRODUCTS

2.1 CONTRACTION JOINT STRIPS

Contraction joint strips shall be 1/8 inch thick tempered hardboard conforming to AHA ANSI/AHA A135.4, Class 1. In lieu of hardboard strips, rigid polyvinylchloride (PVC) or high impact polystyrene (HIPS) insert strips specifically designed to induce controlled cracking in slabs on grade may be used. Such insert strips shall have removable top section.

2.2 PREFORMED EXPANSION JOINT FILLER

Expansion joint filler shall be preformed material conforming to ASTM D 1751. Unless otherwise indicated, filler material shall be 3/8 inch thick and of a width applicable for the joint formed. Backer material, when required, shall conform to ASTM D 5249.

2.3 SEALANT

Joint sealant shall conform to the following:

2.3.1 Preformed Polychloroprene Elastomeric Type

ASTM D 2628.

2.3.2 Hot-Poured Type

ASTM D 1190 tested in accordance with ASTM D 1191.

2.3.3 Field Molded Type

ASTM C 920, Type M for horizontal joints or Type NS for vertical joints, Class 25, and Use NT. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type materials. The back-up material shall be compressible, non-shrink, nonreactive with sealant, and non-absorptive material type such as extruded butyl or polychloroprene rubber.

3 EXECUTION

3.1 JOINTS

Joints shall be installed at locations indicated or otherwise approved by the Contracting Officer.

3.1.1 Contraction Joints

Contraction joints may be constructed by inserting tempered hardboard strips or rigid PVC or HIPS insert strips into the plastic concrete using a steel parting bar, when necessary, or by cutting the concrete with a saw after concrete has set. Joints shall be approximately 1/8 inch wide and shall extend into the slab one-fourth the slab thickness, minimum, but not less than 1 inch.

3.1.1.1 Joint Strips

Strips shall be of the required dimensions and as long as practicable. After the first floating, the concrete shall be grooved with a tool at the joint locations. The strips shall be inserted in the groove and depressed until the top edge of the vertical surface is flush with the surface of the slab. The slab shall be floated and finished as specified. Working of the concrete adjacent to the joint shall be the minimum necessary to fill voids and consolidate the concrete. Where indicated, the top portion of the strip shall be sawed out after the curing period to form a recess for sealer. The removable section of PVC or HIPS strips shall be discarded and the insert left in place. True alignment of the strips shall be maintained during insertion.

3.1.1.2 Sawed Joints

Joint sawing shall be early enough to prevent uncontrolled cracking in the slab, but late enough that this can be accomplished without appreciable spalling. Concrete sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed.

3.1.2 Joint Sealant

Sawed contraction joints and expansion joints in slabs shall be filled with joint sealant, unless otherwise shown. Joint surfaces shall be clean, dry, and free of oil or other foreign material which would adversely affect the bond between sealant and concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant.

3.1.2.1 Joints With Field-Molded Sealant

Joints shall not be sealed when the sealant material, ambient air, or concrete temperature is less than 40 degrees F. Joints requiring a bond breaker shall be coated with curing compound or with bituminous paint. Bond breaker and back-up material shall be installed where required. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

3.2 CONSTRUCTION JOINTS

Construction joints are specified in Section 03300b CAST-IN-PLACE STRUCTURAL CONCRETE except that construction joints coinciding with expansion and contraction joints shall be treated as expansion or contraction joints as applicable.

DIVISION 3 - CONCRETE

SECTION 03200b

CONCRETE REINFORCEMENT

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SECTION 03200b

CONCRETE REINFORCEMENT

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 318/318R	(1995) Building Code Requirements for Structural Concrete and Commentary
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53	(1990b) Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
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ASTM A 184	(1996) Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
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ASTM A 185	(1994) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
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ASTM A 615	(1996a) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
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ASTM A 675	(1990a) Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties
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CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI MSP-1	(1996) Manual of Standard Practice
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1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-04 Drawings

Concrete Reinforcement System; GA.

Detail drawings showing reinforcing steel placement, schedules, sizes, grades, and splicing and bending details. Drawings shall show support details including types, sizes and spacing.

SD-13 Certificates

Reinforcing Steel; FIO.

Certified copies of mill reports attesting that the reinforcing steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified herein, prior to the installation of reinforcing steel.

1.3 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

2 PRODUCTS

2.1 DOWELS

Dowels shall conform to ASTM A 675, Grade 80. Steel pipe conforming to ASTM A 53, Schedule 80, may be used as dowels provided the ends are closed with metal or plastic inserts or with mortar.

2.2 FABRICATED BAR MATS

Fabricated bar mats shall conform to ASTM A 184.

2.3 REINFORCING STEEL

Reinforcing steel shall be deformed bars conforming to ASTM A 615, grades and sizes as indicated.

2.4 WELDED WIRE FABRIC

Welded wire fabric shall conform to ASTM A 185.

2.5 WIRE TIES

Wire ties shall be 16 gauge or heavier black annealed steel wire.

2.6 SUPPORTS

Bar supports for formed surfaces shall be designed and fabricated in accordance with CRSI MSP-1 and shall be steel or precast concrete blocks. Precast concrete blocks shall have wire ties and shall be not less than 4 inches square when supporting reinforcement on ground. Precast concrete block shall have compressive strength equal to that of the surrounding concrete. Where concrete formed surfaces will be exposed to weather or where surfaces are to be painted, steel supports within 1/2 inch of concrete surface shall be galvanized, plastic protected or of stainless steel. Concrete supports used in concrete exposed to view shall have the same color and texture as the finish surface. For slabs on grade, supports shall be precast concrete blocks, plastic coated steel fabricated with bearing plates, or specifically designed wire-fabric supports fabricated of plastic.

3 EXECUTION

3.1 REINFORCEMENT

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 318. Reinforcement shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. Wire tie ends shall face away from the forms.

3.1.1 Placement

Reinforcement shall be free from loose rust and scale, dirt, oil, or other deleterious coating that could reduce bond with the concrete. Reinforcement shall be placed in accordance with ACI 318 at locations shown plus or minus one bar diameter. Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318. If bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional bars required to meet structural requirements, shall be approved before concrete is placed.

3.1.2 Splicing

Splices of reinforcement shall conform to ACI 318 and shall be made only as required or indicated. Splicing shall be by lapping or by mechanical connection; except that lap splices shall not be used for bars larger than No. 11 unless otherwise indicated. Lapped bars shall be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than one-fifth the required length of lap or 6 inches. Mechanical butt splices shall be in accordance with the recommendation of the manufacturer of the mechanical splicing device.

3.2 WELDED-WIRE FABRIC PLACEMENT

Welded-wire fabric shall be placed in slabs as indicated. Fabric placed in slabs on grade shall be continuous between expansion, construction, and contraction joints. Fabric placement at joints shall be as indicated. Lap splices shall be made in such a way that the overlapped area equals the distance between the outermost crosswires plus 2 inches. Laps shall be staggered to avoid continuous laps in either direction. Fabric shall be wired or clipped together at laps at intervals not to exceed 4 feet. Fabric shall be positioned by the use of supports.

3.3 DOWEL INSTALLATION

Dowels shall be installed in slabs on grade at locations indicated and at right angles to joint being doweled. Dowels shall be accurately positioned and aligned parallel to the finished concrete surface before concrete placement. Dowels shall be rigidly supported during concrete placement. One end of dowels shall be coated with a heavy grease as indicated on the drawings.

DIVISION 3 - CONCRETE

SECTION 03300b

CAST-IN-PLACE STRUCTURAL CONCRETE

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SECTION 03300b

CAST-IN-PLACE STRUCTURAL CONCRETE

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214.3R	(1988) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results
ACI 301	(1996) Standard Specifications for Structural Concrete
ACI 305R	(1991) Hot Weather Concreting
ACI 318/318R	(1995) Building Code Requirements for Reinforced Concrete and Commentary

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(1991) Burlap Cloth Made From Jute or Kenaf
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1993) Concrete Aggregates
ASTM C 39	(1994) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42	(1994) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C 78	(1984) Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C 94	(1996) Ready-Mixed Concrete
ASTM C 136	(1995a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143	(1990a) Test Method for Slump of Hydraulic Cement Concrete
ASTM C 150	(1995) Portland Cement
ASTM C 171	(1995) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 173	(1994a) Air Content of Freshly Mixed Concrete by the Volumetric Method
ASTM C 192	(1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1991b) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 260	(1995) Air-Entraining Admixtures for Concrete
ASTM C 309	(1995) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 618	(1996a) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C 940	(1989) Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
ASTM C 1017	(1992) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1064	(1986; R 1993) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1995a) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1107	(1991a) Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D 75	(1987; R 1992) Sampling Aggregates

ASTM D 1751 (1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

CORPS OF ENGINEERS (COE)

COE CRD-C 104 (1980) Method of Calculation of the Fineness Modulus of Aggregate

COE CRD-C 400 (1963) Requirements for Water for Use in Mixing or Curing Concrete

COE CRD-C 521 (1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete

COE CRD-C 540

COE CRD-C 572 (1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44 (1995) NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA TMMB-01 (1992) Truck Mixer Agitator and Front Discharge Concrete Carrier Standards of the Truck Mixer Manufacturers Bureau

NRMCA CPMB 100 (1990) Concrete Plant Standards

NRMCA QC 3 (1984) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready Mixed Concrete Production Facilities

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-08 Statements

Mixture Proportions; FIO.

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of ingredients that will be used in the manufacture of each strength or class of concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an approved independent

commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

SD-09 Reports

Testing and Inspection for Contractor Quality Control; GA.

Certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolan, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

SD-13 Certificates

Qualifications; FIO.

Written documentation for Contractor Quality Control personnel.

1.3 QUALIFICATIONS

Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen.

The foreman or lead journeyman of the flatwork finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

1.4 GENERAL REQUIREMENTS

1.4.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/117R. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing; when forms or shoring are used, the measurements shall be made prior to removal.

1.4.2 Strength Requirements and w/c Ratio

1.4.2.1 Strength Requirements

Specified compressive strength (f'_c) shall be as follows:

COMPRESSIVE STRENGTH

STRUCTURE OR PORTION OF STRUCTURE

4000 psi at 28 days

ALL

Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement. Compressive strength shall be determined in accordance with ASTM C 39. Flexural strength shall be determined in accordance with ASTM C 78.

- a. Evaluation of Concrete Compressive Strength. Compressive strength specimens (6 by 12 inch cylinders) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'_c and no individual test result falls below the specified strength f'_c by more than 500 psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.
- b. Investigation of Low-Strength Compressive Test Results. When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the strength of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. Non-destructive tests (tests other than test cylinders or cores) shall not be used as a basis for acceptance or rejection. The Contractor shall perform the coring and repair the holes. Cores will be tested by the Government.
- c. Load Tests. If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test as being understrength shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed by and at the expense of the Contractor and must be approved by the Contracting Officer, except that if all concrete is found to be in compliance with the drawings and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.
- d. Evaluation of Concrete Flexural Strength. Flexural strength specimens (beams) shall be fabricated by the Contractor and laboratory cured in accordance with ASTM C 31 and tested in accordance with ASTM C 78. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified flexural strength and no individual test result falls below the specified flexural strength by more than 50 psi. A "test" is defined as the

average of two companion beams. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the slab is considered potentially deficient.

1.4.2.2 Water-Cement Ratio

Maximum water-cement ratio (w/c) for normal weight concrete shall be as follows:

WATER-CEMENT RATIO, BY WEIGHT	STRUCTURE OR PORTION OF STRUCTURE
0.50	ALL

These w/c's may cause higher strengths than that required above for compressive or flexural strength. The maximum w/c required will be the equivalent w/c as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and ground granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where silica fume or GGBF slag is used, the weight of the silica fume and GGBF slag shall be included in the equations of ACI 211.1 for the term P which is used to denote the weight of pozzolan.

1.4.3 Air Entrainment

All normal weight concrete shall be air entrained to contain between 4 and 7 percent total air, except that when the nominal maximum size coarse aggregate is 3/4 inch or smaller it shall be between 4.5 and 7.5 percent. Specified air content shall be attained at point of placement into the forms. Air content for normal weight concrete shall be determined in accordance with ASTM C 231.

1.4.4 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be within the following limits. Slump shall be determined in accordance with ASTM C 143.

Structural Element	Slump	
	Minimum	Maximum
Walls, columns and beams	2 in.	4 in.
Foundation walls, substructure walls, footings, slabs, paving	1 in.	3 in.
Any structural concrete approved for placement by pumping:		
At pump	2 in.	6 in.
At discharge of line	1 in.	4 in.

When use of a plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C 494 is permitted to increase the slump of concrete, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.

1.4.5 Concrete Temperature

The temperature of the concrete as delivered shall conform to Articles 3.5.3 and 3.5.4.

1.4.6 Size of Coarse Aggregate

The largest feasible nominal maximum size aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

1.4.7 Special Properties and Products

Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies.

1.5 MIXTURE PROPORTIONS

Concrete shall be composed of portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified.

1.5.1 Proportioning Studies for Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Except as specified for flexural strength concrete, mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192 and tested in accordance with ASTM C 39. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratios required in the paragraph Maximum Allowable w/c Ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and ground granulated blast furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1. In the case where silica fume or GGBF slag is used, the weight of the silica fume and GGBF slag shall be included in the equations in ACI 211.1 for the term P, which is used to denote the weight of pozzolan. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent by weight of the total cementitious material, and the maximum shall be 35 percent. Laboratory trial mixtures shall be designed for maximum permitted slump and air content. Separate sets of trial mixture studies shall be made for each

combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult placing locations. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192. They shall be tested at 7 and 28 days in accordance with ASTM C 39. From these test results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, a curve shall be plotted showing the relationship between 7 day and 28 day strengths. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding.

1.5.2 Average Compressive Strength Required for Mixtures

The mixture proportions selected during mixture design studies shall produce a required average compressive strength (f'_{cr}) exceeding the specified compressive strength (f'_c) by the amount indicated below. This required average compressive strength, f'_{cr} , will not be a required acceptance criteria during concrete production. However, whenever the daily average compressive strength at 28 days drops below f'_{cr} during concrete production, or daily average 7-day strength drops below a strength correlated with the 28-day f'_{cr} , the mixture shall be adjusted, as approved, to bring the daily average back up to f'_{cr} . During production, the required f'_{cr} shall be adjusted, as appropriate, based on the standard deviation being attained on the job.

1.5.2.1 Computations from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths (f'_c) within 1,000 psi of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. Required average compressive strength f'_{cr} used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

$$f'_{cr} = f'_c + 1.34S \text{ where units are in psi}$$

$$f'_{cr} = f'_c + 2.33S - 500 \text{ where units are in psi}$$

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the

calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS	MODIFICATION FACTOR FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

1.5.2.2 Computations without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength f'_{cr} shall be determined as follows:

- a. If the specified compressive strength f'_c is less than 3,000 psi,
 $f'_{cr} = f'_c + 1000 \text{ psi}$
- b. If the specified compressive strength f'_c is 3,000 to 5,000 psi,
 $f'_{cr} = f'_c + 1,200 \text{ psi}$
- c. If the specified compressive strength f'_c is over 5,000 psi,
 $f'_{cr} = f'_c + 1,400 \text{ psi}$

1.6 STORAGE OF MATERIALS

Cement and other cementitious materials shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants and keep each material completely separated. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months or which have been subjected to freezing shall not be used unless retested and proven to meet the specified requirements. Materials shall be capable of being accurately identified after bundles or containers are opened.

1.7 GOVERNMENT ASSURANCE INSPECTION AND TESTING

Day-to day inspection and testing shall be the responsibility of the Contractor Quality Control (CQC) staff. However, representatives of the Contracting Officer will inspect construction as considered appropriate and will monitor operations of the Contractor's CQC staff. Government inspection or testing will not relieve the Contractor of any of his CQC responsibilities.

2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be portland cement, or portland cement in combination with pozzolan and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

2.1.1 Portland Cement

ASTM C 150, Type I low alkali with a maximum 15 percent amount of tricalcium aluminate, or Type II low alkali. White portland cement shall meet the above requirements except that it may be Type I, Type II or Type III low alkali. White Type III shall be used only in specific areas of the structure, when approved in writing.

2.1.2 High-Early-Strength Portland Cement

ASTM C 150, Type III with tricalcium aluminate limited to 5 percent, low alkali. Type III cement shall be used only in isolated instances and only when approved in writing.

2.1.3 Pozzolan (Fly Ash)

ASTM C 618, Class C or F with the optional requirements for multiple factor, drying shrinkage, and uniformity from Table 2A of ASTM C 618. If pozzolan is used, it shall never be less than 15 percent nor more than 35 percent by weight of the total cementitious material.

2.2 AGGREGATES

Aggregates shall conform to the following.

2.2.1 Fine Aggregate

Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

2.2.2 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33, Class 5S, size designation 56.

2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

2.3.1 Air-Entraining Admixture

ASTM C 260 and shall consistently entrain the air content in the specified ranges under field conditions.

2.3.2 Accelerating Admixture

ASTM C 494, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

2.3.3 Water-Reducing or Retarding Admixture

ASTM C 494, Type A, B, or D, except that the 6-month and 1-year compressive and flexural strength tests are waived.

2.3.4 Other Chemical Admixtures

Chemical admixtures for use in producing flowing concrete shall comply with ASTM C 1017, Type I or II. These admixtures shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.4 CURING MATERIALS

2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

2.4.2 Membrane-Forming Compound

Membrane-Forming curing compound shall conform to ASTM C 309, Type 1-D or 2, except that only a styrene acrylate or chlorinated rubber compound meeting Class B requirements shall be used for surfaces that are to be painted or are to receive bituminous roofing, or waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified. Nonpigmented compound shall contain a fugitive dye, and shall have the reflective requirements in ASTM C 309 waived.

2.4.3 Burlap and Cotton Mat

Burlap and cotton mat used for curing shall conform to AASHTO M 182.

2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 NONSHRINK GROUT

Nonshrink grout shall conform to ASTM C 1107 and shall be a commercial formulation suitable for the proposed application.

2.7 JOINT MATERIALS

2.7.1 Joint Fillers and Sealers

Expansion joint fillers shall be preformed materials conforming to ASTM D 1751. Materials for sealing of joints shall conform to the requirements of Section 03150b EXPANSION JOINTS AND CONTRACTION JOINTS.

2.7.2 Contraction Joints in Slabs

Sawable type contraction joint inserts shall conform to COE CRD-C 540. Nonsawable joint inserts shall have sufficient stiffness to permit placement in plastic concrete without undue deviation from a straight line and shall conform to the physical requirements of COE CRD-C 540, with the exception of Section 3.4 "Resistance to Sawing". Plastic inserts shall be polyvinyl chloride conforming to the materials requirements of COE CRD-C 572.

2.8 VAPOR BARRIER

Vapor barrier shall be polyethylene sheeting with a minimum thickness of 6 mils or other equivalent material having a vapor permeance rating not exceeding 0.5 perms as determined in accordance with ASTM E 96.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03100b STRUCTURAL CONCRETE FORMWORK. Reinforcing steel shall be in place, cleaned, tied, and adequately supported, in accordance with Section 03200b CONCRETE REINFORCEMENT. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1 Foundations

3.1.1.1 Concrete on Earth Foundations

Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. Prior to placement of concrete, the foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.

3.1.1.1.1 Vapor Barrier Installation

Vapor barriers shall be applied over earth surfaces of the restroom foundation. Edges shall be lapped not less than 6 inches. All joints shall be sealed with pressure-sensitive adhesive not less than 2 inches wide. The vapor barrier shall be protected at all times to prevent injury or displacement prior to and during concrete placement.

3.1.1.2 Preparation of Previously Placed Concrete

Concrete surfaces to which other concrete is to be bonded shall be abraded in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laitance and loose particles shall be removed. Surfaces shall be thoroughly washed and shall be moist but without free water when concrete is placed.

3.1.2 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Conduit and other embedded items shall be clean and free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding shall not be performed on embedded metals within 1 foot of the surface of the concrete. Tack welding shall not be performed on or to embedded items.

3.2 CONCRETE PRODUCTION

3.2.1 Batching, Mixing, and Transporting Concrete

Concrete shall be furnished from a ready-mixed concrete plant. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94, except as otherwise specified. Truck mixers, agitators, and nonagitator transporting units shall comply with NRMCA TMMB-01. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch tickets shall be furnished for each load of ready-mixed concrete.

3.3 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the placing site in truck mixers, or by approved pumping equipment. Nonagitator equipment, other than pumps, shall not be used for transporting lightweight aggregate concrete.

3.4 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer or transporting unit to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

3.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 2 cubic yards shall not be manually operated. The design of the

bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

3.4.2 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Nonagitating equipment shall be used only for transporting plant-mixed concrete over a smooth road and when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

3.4.3 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

3.4.4 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

3.5 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

3.5.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper

level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns and walls until concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

3.5.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.025 inch, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segregation or flotation of coarse aggregate shall be prevented. Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

3.5.3 Cold Weather Requirements

Special protection measures, approved by the Contracting Officer, shall be used if freezing temperatures are anticipated before the expiration of the specified curing period. The ambient temperature of the air where concrete is to be placed and the temperature of surfaces to receive concrete shall be not less than 40 degrees F. The temperature of the concrete when placed shall be not less than 50 degrees F nor more than 75 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals or other materials shall not be incorporated in the concrete to prevent freezing. Upon written approval, an accelerating admixture conforming to ASTM C 494, Type C or E may be used, provided it contains no calcium chloride. Calcium chloride shall not be used.

3.5.4 Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature Degrees
Greater than 60	90 F
40-60	85 F
Less than 40	80 F

3.5.5 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, as well as interior placements when space heaters produce low humidity, the Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

3.5.6 Placing Concrete in Congested Areas

Special care shall be used to ensure complete filling of the forms, elimination of all voids, and complete consolidation of the concrete when placing concrete in areas congested with reinforcing bars, embedded items, waterstops and other tight spacing. An appropriate concrete mixture shall be used, and the nominal maximum size of aggregate (NMSA) shall meet the specified criteria when evaluated for the congested area. Vibrators with heads of a size appropriate for the clearances available shall be used, and the consolidation operation shall be closely supervised to ensure complete and thorough consolidation at all points. Where necessary, splices of reinforcing bars shall be alternated to reduce congestion. Where two mats of closely spaced reinforcing are required, the bars in each mat shall be placed in matching alignment to reduce congestion.

3.5.7 Placing Flowable Concrete

If a plasticizing admixture conforming to ASTM C 1017 is used or if a Type F or G high range water reducing admixture is permitted to increase the slump, the concrete shall meet all requirements of paragraph GENERAL REQUIREMENTS in PART 1. Extreme care shall be used in conveying and placing the concrete to avoid segregation. Consolidation and finishing shall meet all requirements of paragraphs Placing Concrete, Finishing Formed Surfaces, and Finishing Unformed Surfaces. No relaxation of requirements to accommodate flowable concrete will be permitted.

3.6 JOINTS

Joints shall be located and constructed as indicated or otherwise approved by the Contracting Officer. Reinforcement shall be 2 inches clear from each joint. Except where otherwise indicated, construction joints between interior slabs on grade and vertical surfaces shall consist of 30 pound asphalt-saturated felt, extending for the full depth of the slab. The perimeters of the slabs shall be free of fins, rough edges, spalling, or other unsightly appearance. Reservoir for sealant for construction and contraction joints in slabs shall be formed to the dimensions shown on the drawings by removing snap-out joint-forming inserts, by sawing sawable inserts, or by sawing to widen the top portion of sawed joints. Joints to be sealed shall be cleaned and sealed as indicated and in accordance with Section 03150 EXPANSION JOINTS AND CONTRACTION JOINTS.

3.6.1 Construction Joints

Where concrete work is interrupted by weather, end of work shift or other similar type of delay, location and type of construction joint shall be subject to approval of the Contracting Officer. Unless otherwise indicated and except for slabs on grade, reinforcing steel shall extend through construction joints. Construction joints in slabs on grade shall be keyed or doweled as shown.

3.6.2 Contraction Joints in Slabs on Grade

Contraction Joints shall be produced by forming a weakened plane in the concrete slab by sawing a continuous slot with a concrete saw. Regardless of method used to produce the weakened plane, it shall be 1/4 the depth of the slab thickness and between 1/8 and 3/16 inch wide. For saw-cut joints, cutting shall be timed properly with the set of the concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent ravelling of the edges of the saw cut. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking. Reservoir for joint sealant shall be formed as previously specified.

3.6.3 Expansion Joints

Installation of expansion joints and sealing of these joints shall conform to the requirements of Section 03150b EXPANSION JOINTS AND CONTRACTION JOINTS.

3.6.4 Dowels and Tie Bars

Dowels and tie bars shall be installed at the locations shown on the drawings and to the details shown, using materials and procedures specified in Section 03200b CONCRETE REINFORCEMENT and herein. Conventional smooth "paving" dowels shall be installed in slabs using approved methods to hold the dowel in place during concreting within a maximum alignment tolerance of 1/8 inch in 12 inches. "Structural" type deformed bar dowels, or tie bars, shall be installed to meet the specified tolerances. Care shall be taken during placing adjacent to and around dowels and tie bars to ensure there is no displacement of the dowel or tie bar and that the concrete completely embeds the dowel or tie bar and is thoroughly consolidated.

3.7 FINISHING FORMED SURFACES

Forms, form materials, and form construction are specified in Section 03100b STRUCTURAL CONCRETE FORMWORK. Finishing of formed surfaces shall be as specified herein. Unless another type of architectural or special finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that requires a Class A or B finish. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or drummy areas at the completion of the contract. Repairs not meeting these requirements will be rejected and shall be replaced.

3.7.1 Class C Finish

Class C finish is required for all structures unless otherwise shown on drawings. Fins, ravelings, and loose material shall be removed, and, except as otherwise indicated or as specified in Section 03100b STRUCTURAL CONCRETE FORMWORK, holes left by removal of form ties shall be reamed and filled. Honeycomb and other defects more than 1/2 inch deep or more than 2 inches in diameter shall be repaired. Defects more than 2 inches in diameter shall be cut back to sound concrete, but in all cases at least 1 inch deep.

3.7.2 Curb and Gutter

The edges of the gutter and top of the curb shall be rounded with an edging tool to a radius of 1/2 inch and the surfaces shall be floated and finished

with a smooth wood float until true to grade and section and uniform in texture. Floated surfaces shall then be brushed with a fine-hair brush with longitudinal strokes. Immediately after removing the front curb form, the face of the curb shall be rubbed with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed, and shall be uniform in color, shape and appearance. The surface while still wet, shall be brushed in the same manner as the gutter and curb top. The top surface of the gutter and entrance shall be finished to grade with a wood float.

3.8 REPAIRS

3.8.1 Damp-Pack Mortar Repair

Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter but not over 4 inches shall be repaired by the damp-pack mortar method. Form tie holes shall be reamed and other similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1 part portland cement to 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water. Only sufficient water shall be used to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use. Mortar shall be thoroughly tamped in place in thin layers using a hammer and hardwood block. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the outside face. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

3.8.2 Repair of Major Defects

Major defects will be considered to be those more than 1/2 inch deep or, for Class A and B finishes, more than 1/2 inch in diameter and, for Class C and D finishes, more than 2 inches in diameter. Also included are any defects of any kind whose depth is over 4 inches or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

3.8.2.1 Surface Application of Mortar Repair

Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 2 inches on all sides. All such defective areas greater than 12 square inches shall be outlined by saw cuts at least 1 inch deep. Defective areas less than 12 square inches shall be outlined by a 1 inch deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed

mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Contracting Officer's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a mortar gun is used, the gun shall be a small compressed air-operated gun to which the mortar is slowly hand fed and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

3.8.2.2 Repair of Deep and Large Defects

Deep and large defects will be those that are more than 6 inches deep and also have an average diameter at the surface more than 18 inches or that are otherwise so identified by the Project Office. Such defects shall be repaired as specified herein or directed, except that defects which affect the strength of the structure shall not be repaired and that portion of the structure shall be completely removed and replaced. Deep and large defects shall be repaired by procedures approved in advance including forming and placing special concrete using applied pressure during hardening. Preparation of the repair area shall be as specified for surface application of mortar. In addition, the top edge (surface) of the repair area shall be sloped at approximately 20 degrees from the horizontal, upward toward the side from which concrete will be placed. The special concrete shall be a concrete mixture with low water content and low slump, and shall be allowed to age 30 to 60 minutes before use. Concrete containing a specified expanding admixture may be used in lieu of the above mixture; the paste portion of such concrete mixture shall be designed to have an expansion between 2.0 and 4.0 percent when tested in accordance with ASTM C 940. A full width "chimney" shall be provided at the top of the form on the placing side to ensure filling to the top of the opening. A pressure cap shall be used on the concrete in the chimney with simultaneous tightening and revibrating the form during hardening to ensure a tight fit for the repair. The form shall be removed after 24 hours and immediately the chimney shall be carefully chipped away to avoid breaking concrete out of the repair; the surface of the repair concrete shall be dressed as required.

3.9 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, when tested as specified herein.

3.9.1 General

The ambient temperature of spaces adjacent to unformed surfaces being finished and of the base on which concrete will be placed shall be not less than 50 degrees F. In hot weather all requirements of paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking shall be met. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Unless otherwise shown on the drawings, exterior surfaces shall be sloped for drainage, as directed. Where drains are provided, interior floors shall be evenly sloped to the drains. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or "jitterbugs" shall not be used for any surfaces. The dusting of surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any slabs with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

3.9.2 Rough Slab Finish

As a first finishing operation for all unformed surfaces , the surface shall receive an initial slab finish prepared as follows. The concrete shall be uniformly placed across the slab area, consolidated as previously specified, and then screeded with straightedge strikeoffs immediately after consolidation to bring the surface to the required finish level with no coarse aggregate visible. Side forms and screed rails shall be provided, rigidly supported, and set to exact line and grade. Allowable tolerances for finished surfaces apply only to the hardened concrete, not to forms or screed rails. Forms and screed rails shall be set true to line and grade. "Wet screeds" shall not be used.

3.9.3 Floated Finish

All slabs shall next be given a wood float finish. The screeding shall be followed immediately by darbying or bull floating before bleeding water is present, to bring the surface to a true, even plane. Then, after the concrete has stiffened so that it will withstand a man's weight without imprint of more than 1/4 inch and the water sheen has disappeared, it shall be floated to a true and even plane free of ridges. Floating shall be performed by use of suitable hand floats or power driven equipment. Sufficient pressure shall be used on the floats to bring a film of moisture to the surface. Hand floats shall be made of wood, magnesium, or aluminum. Lightweight concrete or concrete that exhibits stickiness shall be floated with a magnesium float. Care shall be taken to prevent over-finishing or incorporating water into the surface.

3.10 CURING AND PROTECTION

3.10.1 General

Concrete shall be cured by an approved method for the period of time given below:

Concrete with Type III cement	3 days
All other concrete	7 days

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the curing period. Air and forms in contact with concrete shall be maintained at a temperature above 50 degrees F for the first 3 days and at a temperature above 32 degrees F for the remainder of the specified curing period. Exhaust fumes from combustion heating units shall be vented to the outside of the enclosure, and heaters and ducts shall be placed and directed so as not to cause areas of overheating and drying of concrete surfaces or to create fire hazards. Materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat, including welding, shall be permitted near or in direct contact with the concrete at any time. Except as otherwise permitted by paragraph Membrane Forming Curing Compounds, moist curing shall be provided for any areas to receive floor hardener, any paint or other applied coating, or to which other concrete is to be bonded. Concrete containing silica fume shall be initially cured by fog misting during finishing, followed immediately by continuous moist curing. Except for plastic coated burlap, impervious sheeting alone shall not be used for curing.

3.10.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. If water or curing materials used stain or discolor concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned as approved. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, nonsupporting vertical forms shall be broken loose from the concrete soon after the concrete hardens and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day.

3.10.3 Membrane Forming Curing Compounds

Membrane curing shall not be used on surfaces that are to receive any subsequent treatment depending on adhesion or bonding to the concrete, including surfaces to which a smooth finish is to be applied or other concrete to be bonded. However, a styrene acrylate or chlorinated rubber compound meeting ASTM C 309, Class B requirements, may be used for surfaces which are to be painted or are to receive bituminous roofing or

waterproofing, or floors that are to receive adhesive applications of resilient flooring. The curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing or flooring specified. Membrane curing compound shall not be used on surfaces that are maintained at curing temperatures with free steam. Curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. All surfaces shall be thoroughly moistened with water. Curing compound shall be applied to slab surfaces as soon as the bleeding water has disappeared, with the tops of joints being temporarily sealed to prevent entry of the compound and to prevent moisture loss during the curing period. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 75 psi, at a uniform coverage of not more than 400 square feet per gallon for each coat, and the second coat shall be applied perpendicular to the first coat. Concrete surfaces which have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. Surfaces on which clear compound is used shall be shaded from direct rays of the sun for the first 3 days. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic, and from other sources of abrasion and contamination during the curing period.

3.10.4 Impervious Sheeting

Except for plastic coated burlap, impervious sheeting alone shall not be used for curing. Impervious-sheet curing shall only be used on horizontal or nearly horizontal surfaces. Surfaces shall be thoroughly wetted and be completely covered with the sheeting. Sheeting shall be at least 18 inches wider than the concrete surface to be covered. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 12 inches and securely weighted down or shall be lapped not less than 4 inches and taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

3.10.5 Ponding or Immersion

Concrete shall be continually immersed throughout the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete.

3.10.6 Cold Weather Curing and Protection

When the daily ambient low temperature is less than 32 degrees F the temperature of the concrete shall be maintained above 40 degrees F for the first seven days after placing. During the period of protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by suitable temperature measuring devices furnished by the Government, as required, and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor as directed.

3.11 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and shall submit specified reports. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease and the operation shall be corrected. The laboratory performing the tests shall be onsite and shall conform with ASTM C 1077. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per month thereafter for conformance with ASTM C 1077.

3.11.1 Grading and Corrective Action

3.11.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

3.11.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

3.11.2 Quality of Aggregates

Thirty days prior to the start of concrete placement, the Contractor shall perform all tests for aggregate quality required by ASTM C 33. In addition,

after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every three months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

3.11.3 Scales, Batching and Recording

The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every three months. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. At the same time, the Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.11.4 Batch-Plant Control

The measurement of concrete materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during each day's plant operation.

3.11.5 Concrete Mixture

- a. Air Content Testing. Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Tests shall be made in accordance with ASTM C 231 for normal weight concrete and ASTM C 173 for lightweight concrete. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single test result reaches either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the air content and the control chart for range, and for determining need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate control chart for each mixture on which an "average line" is set at the midpoint of

the specified air content range from paragraph Air Entrainment. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line, respectively. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a secondary control chart for range where an upper warning limit is set at 2.0 percentage points and an upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the air content at the mixer controlled as directed.

- b. Air Content Corrective Action. Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the secondary control chart for range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted.
- c. Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump for each type of mixture. The upper warning limit shall be set at 1/2 inch below the maximum allowable slump specified in paragraph Slump in PART 1 for each type of concrete and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer. However, the Contractor is

responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer, and the slump at the mixer controlled as directed.

- d. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an adjustment shall immediately be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c ratio specified, based on aggregates which are in a saturated surface dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted, and the Contractor shall take appropriate steps to bring the slump under control. Additional slump tests shall be made as directed.
- e. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064. The temperature shall be reported along with the compressive strength data.
- f. Strength Specimens. At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 500 cubic yards or portion thereof of that concrete mixture placed each day. Additional sets of test specimens shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A truly random (not haphazard) sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph Strength Requirements in PART 1 shall consist of four specimens, two to be tested at 7 days and two at 28 days. Test specimens shall be molded and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39 for test cylinders and ASTM C 78 for test beams. Results of all strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength "tests", ("test" as defined in paragraph Strength Requirements in PART 1) moving average of last 3 "tests" for strength, and moving average for range for the last 3 "tests" for each mixture. The charts shall be similar to those found in ACI 214.3R.

3.11.6 Inspection Before Placing

Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.11.7 Placing

The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Contracting Officer, and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.11.8 Vibrators

The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing. Any vibrator not meeting the requirements of paragraph Consolidation, shall be immediately removed from service and repaired or replaced.

3.11.9 Curing Inspection

- a. Moist Curing Inspections. At least once each shift, and not less than twice per day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
- b. Moist Curing Corrective Action. When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by 1 day.
- c. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the Contractor shall estimate the quantity of compound used by measurement of the container and the area of concrete surface

covered, shall compute the rate of coverage in square feet per gallon, and shall note whether or not coverage is uniform.

- d. Membrane Curing Corrective Action. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.
- e. Sheet Curing Inspection. At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted and recorded.
- f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by 1 day.

3.11.10 Cold-Weather Protection

At least once each shift and once per day on non-work days, an inspection shall be made of all areas subject to cold-weather protection. Any deficiencies shall be noted, corrected, and reported.

3.11.11 Mixer Uniformity

- a. Stationary Mixers. Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the shortest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94.
- b. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

3.11.12 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all contractor quality control records.

Invitation No. DACW66-02-B-0008

DIVISION 04

(NOT USED)

DIVISION 5 - METALS

SECTION 05055b

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

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SECTION 05055b

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA SAS-30	(1986) Aluminum Structures Construction Manual Series - Section 1 Specifications for Aluminum Structures
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997ael) Carbon Structural Steel
ASTM A 123/A 123M	(1997ael) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 325	(1996) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 380	(1994a) Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM A 500	(1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(1999) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 514/A 514M	(1994a) High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
ASTM B 177	(1993) Chromium Electroplating on Steel for Engineering Use
ASTM A 780	(1993a) Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings
ASTM D 962	(1981; R 1994) Aluminum Powder and Paste Pigments for Paints

ASTM E 165 (1995) Liquid Penetrant Examination
Inspection Method

ASTM E 709 (1995) Magnetic Particle Examination

ASME INTERNATIONAL (ASME)

ASME B4.1 (1967; R 1994) Preferred Limits and Fits for
Cylindrical Parts

ASME B46.1 (1985) Surface Texture (Surface Roughness,
Waviness, and Lay)

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1994) Structural Welding Code - Steel

AWS D1.2 (1990) Structural Welding Code - Aluminum

NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE NO. 1 TO NO. 2 Removal of macro-rust, mill scale and exposed
surface metal, and to etch surfaces for
adhesion

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE AMS 3110 (1992; Rev G) Primer Zinc Chromate

SAE AMS 3132 (1994; Rev F) Varnish, Phenolic Resin
Corrosion-Preventive

STRUCTURAL STEEL PAINTING COUNCIL (SSPC)

SSPC SP-5 TO SP-10 Metal blast methods using synthetic silica
grit

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-04 Drawings

Detail Drawings; GA.

Detail drawings for handrails and other metalwork and machine work shall be submitted and approved prior to fabrication.

Installation;

Manufacturer's installation and maintenance manual.

Materials;

A listing indicating the furnishings provided have been in proven satisfactory use for at least 2 years.

SD-08 Statements

Welding Procedures for Structural Steel; FIO

Schedules of welding procedures for steel structures shall be submitted and approved prior to commencing fabrication.

Welding of Aluminum; FIO

Schedules of welding processes for aluminum fabrications shall be submitted and approved prior to commencing fabrication.

Structural Steel Welding Repairs; FIO

Welding repair plans for steel shall be submitted and approved prior to making repairs.

SD-09 Reports

Tests, Inspections, and Verifications; FIO.

Certified test reports for materials shall be submitted with all materials delivered to the site.

SD-13 Certificates

Qualification of Welders and Welding Operators; FIO.

Certifications for welders and welding operators shall be submitted prior to commencing fabrication.

Welding of Aluminum; FIO

Certified report for aluminum welding qualification tests shall be submitted and approved prior to commencing welding.

1.3 METALWORK AND MACHINE WORK DETAIL DRAWINGS

Detail drawings for handrails and other miscellaneous metalwork and machine work shall include catalog cuts, templates, fabrication and assembly details and type, grade and class of material as appropriate. Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the detail drawings. Drawings shall also indicate, by notes and/or drawings, the plan of erection. This erection plan shall include all details necessary to ascertain that transportation, lifting, and installation will not damage the structural members. The erection plan shall include, but not be limited to:

- a. Configuration and position (flat, vertical or specified other) during transportation, lifting, and installation.

1.4 QUALIFICATION OF WELDERS AND WELDING OPERATORS

The Contractor shall certify that the qualification of welders and welding operators and tack welders who will perform structural steel welding have been qualified for the particular type of work to be done in accordance with

the requirements of AWS D1.1, Section 5, prior to commencing fabrication. The certificate shall list the qualified welders by name and shall specify the code and procedures under which qualified and the date of qualification. Prior qualification will be accepted if welders have performed satisfactory work under the code for which qualified within the preceding three months. The Contractor shall require welders to repeat the qualifying tests when their work indicates a reasonable doubt as to proficiency. Those passing the requalification tests will be recertified. Those not passing will be disqualified until passing. All expenses in connection with qualification and requalification shall be borne by the Contractor.

2 PRODUCTS

2.1 FABRICATION

2.1.1 Structural Fabrication

Material must be straight before being laid off or worked. If straightening is necessary it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted except where welding is definitely specified, indicated or otherwise approved. Bends shall be made by approved dies, press brakes or bending rolls. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in a manner that will not impair the original properties of the metal. Proposed flame cutting of material other than structural steel shall be subject to approval and shall be indicated on detail drawings. Shearing shall be accurate and all portions of the work shall be neatly finished. Corners shall be square and true unless otherwise shown. Re-entrant cuts shall be filleted to a minimum radius of 3/4 inch unless otherwise approved. Finished members shall be free of twists, bends and open joints. Bolts, nuts and screws shall be tight.

2.1.1.1 Dimensional Tolerances for Structural Work

Dimensions shall be measured by an approved calibrated steel tape of approximately the same temperature as the material being measured. The overall dimensions of an assembled structural unit shall be within the tolerances indicated on the drawings or as specified in the particular section of these specifications for the item of work. Where tolerances are not specified in other sections of these specifications or shown, an allowable variation of 1/32 inch is permissible in the overall length of component members with both ends milled and component members without milled ends shall not deviate from the dimensions shown by not more than 1/16 inch for members 30 feet or less in length and by more than 1/8 inch for members over 30 feet in length.

2.1.1.2 Structural Steel Fabrication

Structural steel may be cut by mechanically guided or hand-guided torches, provided an accurate profile with a surface that is smooth and free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1, Subsection 3.2. Where structural steel is not to be welded, chipping or grinding will not be required except as necessary to remove slag and sharp edges of mechanically guided or hand-guided cuts not exposed to view. Hand-guided cuts which are to be exposed or visible shall be chipped, ground or machined to sound metal.

2.1.1.3 Structural Aluminum Fabrication

Laying out and cutting of aluminum shall be in accordance with the AA SAS-30, Section 6.

2.1.2 Welding

2.1.2.1 Welding of Structural Steel

a. Welding Procedures for Structural Steel - Welding procedures for structural steel shall be prequalified as described in AWS D1.1, Subsection 5.1 or shall be qualified by tests as prescribed in AWS D1.1, Section 5. Properly documented evidence of compliance with all requirements of these specifications for previous qualification tests shall establish a welding procedure as prequalified. For welding procedures qualified by tests, the test welding and specimen testing must be witnessed and the test report document signed by the Contracting Officer. Approval of any welding procedure will not relieve the Contractor of the responsibility for producing a finished structure meeting all requirements of these specifications. The Contractor will be directed or authorized to make any changes in previously approved welding procedures that are deemed necessary or desirable by the Contractor Officer. The Contractor shall submit a complete schedule of welding procedures for each steel structure to be welded. The schedule shall conform to the requirements specified in the provisions AWS D1.1, Sections 2, 3, 4, 7 and 9 and applicable provisions of Section 10. The schedule shall provide detailed procedure specifications and tables or diagrams showing the procedures to be used for each required joint. Welding procedures must include filler metal, preheat, interpass temperature and stress-relief heat treatment requirements. Each welding procedure shall be clearly identified as being prequalified or required to be qualified by tests. Welding procedures must show types and locations of welds designated or in the specifications to receive nondestructive examination.

b. Welding Process - Welding of structural steel shall be by an electric arc welding process using a method which excludes the atmosphere from the molten metal and shall conform to the applicable provisions of AWS D1.1, Sections 1 thru 7, 9, 10 and 11. Welding shall be such as to minimize residual stresses, distortion and shrinkage.

c. Welding Technique

(1) Filler Metal - The electrode, electrode-flux combination and grade of weld metal shall conform to the appropriate AWS specification for the base metal and welding process being used or shall be as shown where a specific choice of AWS specification allowables is required. The AWS designation of the electrodes to be used shall be included in the schedule of welding procedures. Only low hydrogen electrodes shall be used for manual shielded metal-arc welding regardless of the thickness of the steel. A controlled temperature storage oven shall be used at the job site as prescribed by AWS D1.1, Subsection 4.5 to maintain low moisture of low hydrogen electrodes.

(2) Preheat and Interpass Temperature - Preheating shall be performed as required by AWS D1.1, Subsection 4.2 and 4.3 or as otherwise specified except that the temperature of the base metal shall be at least 70 degrees F. The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air.

(3) Stress-Relief Heat Treatment - Where stress relief heat treatment is specified or shown, it shall be in accordance with the requirements of AWS D1.1, Subsection 4.4 unless otherwise authorized or directed.

d. Workmanship - Workmanship for welding shall be in accordance with AWS D1.1, Section 3 and other applicable requirements of these specifications.

(1) Preparation of Base Metal - Prior to welding the Contractor shall inspect surfaces to be welded to assure compliance with AWS D1.1, Subsection 3.2.

(2) Temporary Welds - Temporary welds required for fabrication and erection shall be made under the controlled conditions prescribed for permanent work. Temporary welds shall be made using low-hydrogen welding electrodes and by welders qualified for permanent work as specified in these specifications. Preheating for temporary welds shall be as required by AWS D1.1 for permanent welds except that the minimum temperature shall be 120 degrees F in any case. In making temporary welds arcs shall not be struck in other than weld locations. Each temporary weld shall be removed and ground flush with adjacent surfaces after serving its purpose.

(3) Tack Welds - Tacks welds that are to be incorporated into the permanent work shall be subject to the same quality requirements as the permanent welds and shall be cleaned and thoroughly fused with permanent welds. Preheating shall be performed as specified above for temporary welds. Multiple-pass tack welds shall have cascaded ends. Defective tack welds shall be removed before permanent welding.

2.1.2.2 Welding of Steel Castings

Unsound material shall be removed from the surfaces of steel castings to be incorporated into welded connections by chipping, machining, air-arc gouging or grinding. Major connections designed for transfer of stresses shall not be welded if the temperature of the casting is lower than 100 degrees F. Castings containing over 0.35 percent carbon or over 0.75 percent manganese shall be preheated to a temperature not to exceed 450 degrees F and welding shall be accomplished while the castings are maintained at a temperature above 350 degrees F. Welding will not be permitted on castings containing carbon in excess of 0.45 percent except on written authorization. Castings requiring welding repairs after the first annealing and castings involving welding fabrication shall be stress-relieved annealed prior to receiving final machining unless otherwise permitted.

2.1.2.3 Welding of Aluminum

Welding of aluminum shall conform to AA SAS-30 or AWS D1.2, Sections 1 through 7, 9 and 10. The welding process and welding operators shall be prequalified as required by AWS D1.2, Section 5 or AA SAS-30. A certified report giving the results of the qualifying tests shall be furnished for approval. A complete schedule of the welding process for each aluminum fabrication to be welded shall be furnished for approval.

2.1.3 Bolted Connections

2.1.3.1 Bolted Structural Steel Connections

Bolts, nuts and washers shall be of the type specified or indicated. All nuts shall be equipped with washers except for high strength bolts. Beveled washers shall be used where bearing faces have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Where the use of high strength bolts is specified or indicated the materials, workmanship and installation shall conform to the applicable provisions of ASTM A 325 or ASTM A 490.

a. Bolt Holes - Bolt holes shall be accurately located, smooth, perpendicular to the member and cylindrical.

(1) Holes for regular bolts shall be drilled or subdrilled and reamed in the shop and shall not be more than 1/16 inch larger than the diameter of the bolt.

(2) Holes for fitted bolts shall be match-reamed or drilled in the shop. Burrs resulting from reaming shall be removed. The threads of bolts shall be entirely outside of the holes. The body diameter of bolts shall have tolerances as recommended by ASME B4.1 for the class of fit specified. Fitted bolts shall be fitted in reamed holes by selective assembly to provide an LN-2 fit.

(3) Holes for high strength bolts shall have diameters of not more than 1/16 inch larger than bolt diameters. If the thickness of the material is not greater than the diameter of the bolts the holes may be punched. If the thickness of the material is greater than the diameter of the bolts the holes may be drilled full size or subpunched or subdrilled at least 1/8 inch smaller than the diameter of the bolts and then reamed to full size. Poor matching of holes will be cause for rejection. Drifting occurring during assembly shall not distort the metal or enlarge the holes. Reaming to a larger diameter of the next standard size bolt will be allowed for slight mismatching.

2.1.3.2 Bolted Aluminum Connections

Punching, drilling, reaming and bolting for bolted aluminum connections shall conform to the requirements of AA SAS-30, Section 6.

2.2 MACHINE WORK

Tolerances, allowances and gauges for metal fits between plain, non-threaded, cylindrical parts shall conform to ASME B4.1 for the class of fit shown or required unless otherwise shown on approved detail drawings. Where

fits are not shown they shall be suitable as approved. Tolerances for machine-finished surfaces designated by non-decimal dimensions shall be within 1/64 inch. Sufficient machining stock shall be allowed on placing pads to ensure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. Journal surfaces shall be polished and all surfaces shall be finished with sufficient smoothness and accuracy to ensure proper operation when assembled. Parts entering any machine shall be accurately machined and all like parts shall be interchangeable except that parts assembled together for drilling or reaming of holes or machining will not be required to be interchangeable with like parts. All drilled holes bolts shall be accurately located.

2.2.1 Finished Surfaces

Surface finishes indicated or specified shall be in accordance with ASME B46.1. Values of required roughness heights are arithmetical average deviations expressed in microinches. These values are maximum. Lesser degrees will be satisfactory unless otherwise indicated. Compliance with surface requirements shall be determined by sense of feel and visual inspection of the work compared to Roughness Comparison Specimens in accordance with the provisions of ASME B46.1. Values of roughness width and waviness height shall be consistent with the general type of finish specified by roughness height. Where the finish is not indicated or specified it shall be that which is most suitable for the particular surface, provide the class of fit required and be indicated on the detail drawings by a symbol which conforms to ASME B46.1 when machine finishing is provided. Flaws such as scratches, ridges, holes, peaks, cracks or checks which will make the part unsuitable for the intended use will be cause for rejection.

2.2.2 Unfinished Surfaces

All work shall be laid out to secure proper matching of adjoining unfinished surfaces unless otherwise directed. Where there is a large discrepancy between adjoining unfinished surfaces they shall be chipped and ground smooth or machined to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts shall be filled in an approved manner.

2.2.3 Metallic Coatings

2.2.3.1 Zinc Coatings

Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM A 123. Zinc coatings shall be applied to assemblies after fabrication where practicable. Where zinc coatings are destroyed by cutting, welding or other causes the affected areas shall be regalvanized. Coatings 2 ounces or heavier shall be regalvanized with a suitable low-melting zinc base alloy similar to the recommendations of the American Hot-Dip Galvanizers Association to the thickness and quality specified for the original zinc coating. Coatings less than 2 ounces shall be repaired in accordance with ASTM A 780.

2.2.3.2 Chromium Coatings

Chromium coatings for engineering use shall be applied in conformity with ASTM B 177.

2.2.4 Cleaning of Corrosion-Resisting Steel

Oil, paint and other foreign substances shall be removed from corrosion-resisting steel surfaces after fabrication. Cleaning shall be done by vapor degreasing or by the use of cleaners of the alkaline, emulsion or solvent type. After the surfaces have been cleaned they shall be given a final rinsing with clean water followed by a 24 hour period during which the surfaces are intermittently wet with clean water and then allowed to dry for the purpose of inspecting the clean surfaces. The surfaces shall be visually inspected for evidence of paint, oil, grease, welding slag, heat treatment scale, iron rust or other forms of contamination. If evidence of foreign substance exist the surface shall be cleaned in accordance with the applicable provisions of ASTM A 380. The proposed method of treatment shall be furnished for approval. After treatment the surfaces shall be visually reinspected. Brushes used to remove foreign substances shall have only stainless steel or nonmetallic bristles. Any contamination occurring subsequent to the initial cleaning shall be removed by one or more of the methods indicated above.

2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have required material tests and analyses performed and certified by an approved laboratory to demonstrate that materials are in conformity with the specifications. These tests and analyses shall be performed and certified at the Contractor's expense. Tests, inspections, and verifications shall conform to the requirements of the particular sections of these specifications for the respective items of work unless otherwise specified or authorized. Tests shall be conducted in the presence of the Contracting Officer if so required. The Contractor shall furnish specimens and samples for additional independent tests and analyses upon request by the Contracting Officer. Specimens and samples shall be properly labeled and prepared for shipment.

2.3.1 Nondestructive Testing

When doubt exists as to the soundness of any material part such part may be subjected to any form of nondestructive testing determined by the Contracting Officer. This may include ultrasonic, magnaflux, dye penetrant, x-ray, gamma ray or any other test that will thoroughly investigate the part in question. The cost of such investigation will be borne by the Government. Any defects will be cause for rejection and rejected parts shall be replaced and retested at the Contractor's expense.

2.3.2 Inspection of Structural Steel Welding

The Contractor shall maintain an approved inspection system and perform required inspections in accordance with Contract Clause CONTRACTOR INSPECTION SYSTEM. Welding shall be subject to inspection to determine conformance with the requirements of AWS D1.1, the approved welding procedures and provisions stated in other sections of these specifications. Nondestructive examination of designated welds will be required. Supplemental examination of any joint or coupon cut from any location in any joint may be required.

2.3.2.1 Visual Examination

All completed welds shall be cleaned and carefully examined for insufficient throat or leg sizes, cracks, undercutting, overlap, excessive convexity or reinforcement and other surface defects to ensure compliance with the requirements of AWS D1.1, Section 3 and Section 9, Part D.

2.3.2.2 Nondestructive Examination

The nondestructive examination of shop and field welds shall be performed as designated or described in the sections of these specifications covering the particular items of work.

2.3.2.3 Testing Agency

The nondestructive examination of welds and the evaluation of examination tests as to the acceptability of the welds shall be performed by a testing agency adequately equipped and competent to perform such services or by the Contractor using suitable equipment and qualified personnel. In either case written approval of the examination procedures is required and the examination tests shall be made in the presence of the Contracting Officer. The evaluation of examination tests shall be subject to the approval and all records shall become the property of the Government.

2.3.2.4 Examination Procedures

Examination procedures shall conform to the following requirements.

Ultrasonic Testing - Making, evaluating and reporting ultrasonic testing of welds shall conform to the requirements of AWS D1.1, Section 6, Part C. The ultrasonic equipment shall be capable of making a permanent record of the test indications. A record shall be made of each weld tested.

Radiographic Testing - Making, evaluating and reporting radiographic testing of welds shall conform to the requirements of AWS D1.1, Section 6, Part B.

Magnetic Particle Inspection - Magnetic particle inspection of welds shall conform to the applicable provisions of ASTM E 709.

Dye Penetrant Inspection - Dye penetrant inspection of welds shall conform to the applicable provisions of ASTM E 165.

2.3.2.5 Acceptability of Welds

Welds shall be unacceptable if shown to have defects prohibited by AWS D1.1, Subsection 9.25 or possess any degree of incomplete fusion, inadequate penetration or undercutting.

2.3.2.6 Welds to be Subject to Nondestructive Examination

Ultrasonic testing shall be used for all welds around the roller sleeves and lift brackets of the vertical lift gate. Ultrasonic testing shall also be used for minimum of 10% of the groove and fillet welds in tee or corner joints of the vertical and horizontal gate framing members. The locations for testing shall be as directed.

2.3.2.7 Test Coupons

The Government reserves the right to require the Contractor to remove coupons from completed work when doubt as to soundness cannot be resolved by nondestructive examination. Should tests of any two coupons cut from the work of any welder show strengths less than that specified for the base metal it will be considered evidence of negligence or incompetence and such welder shall be removed from the work. When coupons are removed from any part of a structure the members cut shall be repaired in a neat manner with joints of the proper type to develop the full strength of the members. Repaired joints shall be peened as approved or directed to relieve residual stress. The expense for removing and testing coupons, repairing cut members and the nondestructive examination of repairs shall be borne by the Government or the Contractor in accordance with the Contract Clauses INSPECTION AND ACCEPTANCE.

2.3.3 Supplemental Examination

When the soundness of any weld is suspected of being deficient due to faulty welding or stresses that might occur during shipment or erection the Government reserves the right to perform nondestructive supplemental examinations before final acceptance. The cost of such inspection will be borne by the Government.

2.3.4 Structural Steel Welding Repairs

Defective welds in the structural steel welding repairs shall be repaired in accordance with AWS D1.1, Subsection 3.7. Defective weld metal shall be removed to sound metal by use of air carbon-arc or oxygen gouging. Oxygen gouging shall not be used on ASTM A 514/A 514M steel. The surfaces shall be thoroughly cleaned before welding. Welds that have been repaired shall be retested by the same methods used in the original inspection. Except for the repair of members cut to remove test coupons and found to have acceptable welds costs of repairs and retesting shall be borne by the Contractor.

3 EXECUTION

3.1 INSTALLATION

All parts to be installed shall be thoroughly cleaned. Packing compounds, rust, dirt, grit and other foreign matter shall be removed. Holes and grooves for lubrication shall be cleaned. Enclosed chambers or passages shall be examined to make sure that they are free from damaging materials. Where units or items are shipped as assemblies they will be inspected prior to installation. Disassembly, cleaning and lubrication will not be required except where necessary to place the assembly in a clean and properly lubricated condition. Pipe wrenches, cold chisels or other tools likely to cause damage to the surfaces of rods, nuts or other parts shall not be used for assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly but care shall be taken not to overstress the threads. When a half nut is used for locking a full nut the half nut shall be placed first and followed by the full nut. Threads of all bolts except high strength bolts, nuts and screws shall be lubricated with an approved lubricant before assembly. Threads of corrosion-resisting steel bolts and nuts shall be coated with an approved antigalling compound. Driving and drifting bolts or keys will not be permitted.

3.1.1 Blocking and Wedges

All blocking and wedges used during installation for the support of parts to be grouted in foundations shall be removed before final grouting unless otherwise directed. Blocking and wedges left in the foundations with approval shall be of steel or iron.

3.2 PROTECTION OF FINISHED WORK

3.2.1 Aluminum

Aluminum that shall be in contact with grout or concrete shall be protected from galvanic or corrosive action by being given a coat of zinc-chromate primer and a coat of aluminum paint. Aluminum in contact with structural steel shall be protected against galvanic or corrosive action by being given a coat of zinc-chromate primer and a coat of aluminum paint. The zinc-chromate primer shall conform to SAE AMS 3110. The aluminum paint shall consist of a aluminum paste conforming to ASTM D 962, spar varnish conforming to SAE AMS 3132 and thinner compatible with the varnish. The aluminum paint shall be field mixed in proportion of 2 pounds of paste, not more than one gallon of spar varnish and not more than one pint of thinner.

3.3 TESTS

3.3.1 Workmanship

Workmanship shall be of the highest grade and in accordance with the best modern practices to conform with the specifications for the item of work being furnished.

DIVISION 5 - METALS

SECTION 05720b

HANDRAILS

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HANDRAILS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications shall be referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997ael) Carbon Structural Steel
ASTM A 123/A 123M	(1997ael) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(1998) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 500	(1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	(1999) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 615/A 615M	(1996ael) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 150	(1999a) Portland Cement

NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE)

NACE NO. 1 TO NO. 2	Removal of macro-rust, mill scale and exposed surface metal, and to etch surfaces for adhesion
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STRUCTURAL STEEL PAINTING COUNCIL (SSPC)

SSPC SP-5 TO SP-10	Metal blast methods using synthetic silica grit.
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-04 Shop Drawings.

Handrail Standards; GA

Drawings showing scaled details of proposed handrails, elevations for each type of handrail; dimensions, details, and methods of mounting or anchoring; shape and thickness of materials; and details of construction.

Installation; FIO

Manufacturer's installation and maintenance manual.

Materials; FIO

A listing indicating the furnishings provided have been in proven satisfactory use for at least 2 years.

SD-14 Samples

Finish; FIO

Three sets of color data (tiles) for the handrail system displaying manufacturer's color selections and finishes, and identifying those colors and finishes proposed for use.

1.3 DELIVERY, STORAGE, AND HANDLING

Unload materials with necessary equipment per manufacturer's instructions, store covered out of weather, and keep out of direct sun. Inspect parts within 48 hours of delivery, compare with manufacturer's bill of material, and report any missing or non-conforming parts to manufacturer within this time. The storage area shall be as designated. The materials shall be stored in a dry, covered area until installed.

1.4 INSPECTION

Handrails shall be inspected upon arrival at the job site for conformity to specifications and quality in accordance with paragraph MATERIALS. Unacceptable items shall be removed from the job site.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory use for at least 2 years.

2.1.1 Concrete

Portland cement shall conform to ASTM C 150 Types I, II, or III.

2.1.1.1 Cast-in-Place Concrete

Cast-in-place concrete materials and products shall conform to Section 03300b CAST-IN-PLACE CONCRETE.

2.1.2 Metal

Metallic materials and products shall conform to Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS. Metal components shall be furnished with factory drilled holes. Components shall be free of excess weld and spatter. Metal components with holes that will not be filled by hardware or hidden by other components will be rejected.

2.1.2.1 Steel

Structural steel products shall conform to ASTM A 36/A 36M, ASTM A 500 and ASTM A 501.

2.1.2.2 Reinforcing Steel

Steel used for reinforcement shall be deformed billet steel Grade 40. Steel shall conform to ASTM A 615/A 615M.

2.2 SUMMARY

This Section addresses handrails with accommodations for the following:

- A. River View
- B. Levee walkway
- C. Concrete levee terraces
- D. Handrails for steps and handicap ramps.

2.3 SUBMITTALS

2.3.1 Product Data

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for all handrails and posts.

2.3.2 Shop Drawings

Plans, elevations, and sections for railings, post, accessories, and attachments to other work.

2.3.3 Samples for Color Selection

Manufacturer's color charts consisting of units or sections of units showing the full range of finishes, colors, textures, and patterns available for each exposed material.

Submit 3 sets of color tiles in the full color range, available from the manufacturer. Submit color tile samples to the Contracting Officer for final color selection approval.

For each type of exposed finish required, prepared on Samples of same thickness and material indicated for the Work. If finishes involve normal

color and texture variations, include sample sets showing the full range of variations expected.

2.3.4 Maintenance Data

2.3.4.1 Maintenance Manuals

Provide and include the following procedures in a handrails maintenance manual:

- 1) Methods for maintaining finish
- 2) Precautions for cleaning materials and methods that could be detrimental to the handrail performance.

2.4 QUALITY CONTROL

2.4.1 Installer Qualifications

An experienced installer who has specialized in installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

A list of not less than five (5) installations that have been in service for a period of at least five (5) years in facilities similar to this one (in size, scope and type) shall be provided; contact name and phone number.

2.4.2 Warranty

Supply manufacturer's standard five-year warranty.

2.4.3 Project Conditions

2.4.3.1 Field Measurements

Shop drawings shall include field dimensions.

2.4.4 Acceptable Manufacturer

BRP Enterprises, Lincoln, NE, receiving pricing from Hammill & Associates, Inc. Birmingham, AL / 800-423-6661. or approved equal.

2.5 HANDRAILS

2.5.1 Upper Handrail

Made with 2.875" o.d. x .154" wall thickness, flush-welded carbon steel pipe (reference paragraph 2.1.2.1 for steel product type).

2.5.2 Lower Handrail

Made with 1.900" o.d. x .145" wall thickness, flush-welded carbon steel pipe (reference paragraph 2.1.2.1 for steel product type).

2.5.3 Posts

Made with 2.875" o.d. x .203" wall thickness for post spacing 5'-0" or less and .276" wall thickness for post spacing greater than 5'-0", flush-welded carbon steel pipe, and embedded into concrete as specified on the drawings, per post type application (reference paragraph 2.1.2.1 for steel product type).

2.5.4 Welds

All rails shall be butt welded and ground flush, where they meet and adjoin posts.

2.6 HANDRAILS FINISH

All handrails shall meet or exceed this finish. This process is specified as follows:

- 1) Near white to white metal blast using synthetic silica grit, as specified by the Structural Steel Painting Council (SSPC SP-10 to SP-5) and the National Association of Corrosion Engineers (NACE No. 2 to NACE No. 1) to remove macro-rust, mill scale and exposed surface metal, and to etch the material for maximum powder adhesion.
- 2) Alkali chemical wash to remove micro-rust, grease and oils.
- 3) Fresh water rinse.
- 4) Phosphate treatment to inhibit rust prior to coating.
- 5) Fresh water rinse.
- 6) Non-chrome sealer to create a water break free surface.
- 7) Preheat to eliminate moisture, reduce Faraday cages, and prepare the metal for coating.
- 8) Cool material to enable consistent coating thickness throughout.
- 9) Apply polyester powder base coat to maximize corrosion protection.
- 10) Oven baked to cure powder 50-60% enabling maximum adhesion of the base coat to the metal.
- 11) Apply polyester powder top coat to minimize weathering.

PART 3 EXECUTION

3.1 EXAMINATION

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements, accurate locations, and other conditions affecting railings. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install railings and posts in the locations identified on the project drawings and shop drawings. Fasten securely to substrates according to manufacturer's written installation instructions. Field verification of lines and grades is required before fabrication.

3.3 ADJUSTING

- 1) Adjust and align to upright position.
- 2) Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.

Invitation No. DACW66-02-B-0008

DIVISIONS 06 THRU 08

(NOT USED)

DIVISION 6-TOC-1

DIVISION 9 - FINISHES

SECTION 09900b

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SECTION 09900b

PAINTING

1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1.1 Federal Specifications (FS)

FS TT-C-535	(Rev B; Am2) Coating, Epoxy, Two Components for Int. Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete and Masonry
FS TT-E-545	(Rev C) Primer (Enamel-Undercoat, Alkyd, Odorless, Interior, Flat, Tints and White)
FS TT-F-1098	(Rev D) Filler, Block, Solvent-Thinned, For Porous Surfaces
FS TT-P-19	(Rev D) Paint, Latex (Acrylic Emulsion, Exterior Wood and Masonry)
FS TT-P-38	(Rev E) Paint, Aluminum (Ready-Mixed)
FS TT-P-645	(Rev B) Primer, Paint, Zinc-Chromate, Alkyd Type

1.1.2 Federal Standard (FED-STD)

FED-STD 595	(Rev B) Colors
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1.2 SUBMITTALS

The following shall be submitted to the Contracting Officer, prior to installation, in accordance with Section 01330b SUBMITTAL PROCEDURES:

1.2.1 Color Chips

All colors, including tones, shall be selected and approved by the Contracting Officer. Panels or color chips of finish and color shall be prepared by the Contractor and submitted for approval of the Contracting Officer prior to application. At the option of the Contracting Office, colors may be selected from Federal Standard No. 595. This submittal shall be made at the same time as the quarry tile and plastic laminate submittals are made.

1.3 STORAGE

Paints shall be protected from exposure to cold weather by storing in shelters to prevent freezing of the paint.

1.4 PACKING AND LABELING

Paints shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use. Pigmented paints shall be furnished in containers not larger than 5 gallons. Materials shall conform to the specifications shown in the painting schedule herein and to the requirements herein. No paint or coating material shall contain asbestos containing materials.

1.5 ENVIRONMENTAL CONDITIONS

Paints other than water thinned coatings shall be applied only to surfaces that are completely free of surface moisture as determined by sight or touch. In no case shall paint be applied to surfaces upon which there is visible frost or ice. While painting is being done, the temperature of the surfaces to be painted and of the atmosphere in contact therewith shall be maintained at or above 50 degrees F. for water-thinned coating and 45 degrees F. for other coatings. During periods of inclement weather, painting may be continued by enclosing the surfaces with temporary shelters and applying artificial heat, provided the temperature requirements prescribed above are maintained. Salamanders and open fires will not be permitted.

1.6 GENERAL

The term "paint", as used herein, includes emulsions, enamels, paints, stains, varnishes, sealers, cement filler, and other coatings, whether used as prime, intermediate, or finish coats. All work shall be done in a workmanlike manner, so that the finish surfaces shall be free from runs, drops, ridges, waves, laps and unnecessary brush marks.

1.7 MEASUREMENT AND PAYMENT

Payment for the work required by this section shall be included in the contract lump-sum price bid for which the work item pertains. This price shall include full compensation for completing the work as outlined on the drawings and in these specifications.

2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the respective specifications listed for use in PART 3 EXECUTION.

2.2 HAZARDOUS MATERIALS RESTRICTIONS

Paints and painting practices shall comply with all applicable state and local laws enacted to insure compliance with Federal Clean Air Standards.

2.3 MERCURY

Mercurial fungicides shall not be used in exterior oil paints.

3 EXECUTION

3.1 CLEANING AND PREPARATION OF SURFACES

3.1.1 General

Hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in contact with painted surfaces and not to be painted shall be removed prior to surface preparation and painting operations. Following completion of painting of each space, removed items shall be reinstalled. Such removal and reinstalling shall be done by workmen skilled in the trades involved. Exposed nails and other ferrous metal on surfaces to be painted with water-thinned paints shall be spot-primed with zinc dust-zinc oxide or red lead metal primer. Surfaces to be painted shall be clean before applying paint or surface treatment. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning, except when sandblasting is employed. Cleaning solvents shall be low toxicity and shall have flash point in excess of 100 degrees F. Cleaning and painting shall be so programmed that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

3.1.2 Surface Preparation

The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be so completed that the addition of another coat of paint would not increase the hiding. Each coat shall be so applied as to produce a film of uniform thickness. Special attention shall be giving to insure that edges, corners, crevices, welds, and rivets receive a film thickness equivalent to that of adjacent painted surfaces. Respirators shall be worn by persons engaged or assisting in spray painting. Adjacent areas and installations shall be protected by the use of drop cloths or other approved precautionary measures. Metal surfaces adjacent to surfaces to receive water-thinned paints shall be primed and/or touched up prior to the application of water-thinned paints.

3.1.2.1 Method of Surface Preparation

Method of surface preparation and pretreatment shown in the schedule is for identification purposes only. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with the detailed requirements herein before described.

3.2 MIXING AND THINNING

At time of application, paint shall show no signs of deterioration. Paint shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Paints of different manufacturers shall not be mixed together. Where necessary to suit conditions of surface, temperature, weather, and method of application, packaged paint other than cement-emulsion filler may be thinned immediately prior to application in accordance with the manufacturer's directions, but not in excess of one pint of suitable thinner per gallon. The use of thinner for any reason shall not relieve the Contractor from obtaining complete hiding.

3.3 APPLICATION

3.3.1 Time Between Surface Preparation and Painting

Surfaces that have been cleaned, pretreated, and/or otherwise prepared for painting shall be given a coat of the specified first coat material as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surface.

3.3.2 Interior Concrete Surfaces

All interior concrete floor surfaces shall receive two applications of Miracle Sealants Company product 511 (CST) Concrete Surface Treatment or approved equal. Application rates shall be 250 square feet per gallon for the first application and 500 square feet for the second application. Miracle Sealants Company is located at 12806 Schabarum Avenue, Bldg. A, Irwindale, CA 91706, PH (626) 814-8988 or 1-800-851-8932, web site www.miraclesealants.com or approved equal.

3.3.3 Ferrous Surfaces

Ferrous surfaces that have not been shop coated shall be solvent-cleaned to remove oil and grease, then mechanically cleaned by power wire-brushing or blast cleaning to remove loose rust, loose mill scale, and other foreign substances. Minor amounts of residual rust that cannot be removed except by thorough blast cleaning and tight mill scale that cannot be removed by applying a sharp knife to any edge bill be permitted. After cleaning, one coat of paint conforming to Federal Specification, TT-P-38, shall be applied. Shop-coated metal shall be protected from corrosion before and after installation by treating corroded areas immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be wire-brushed and touched-up with the same material as the shop coat.

3.4 SURFACES TO BE PAINTED

3.4.1 General

Except as specified under SURFACES NOT TO BE PAINTED, the surfaces listed in the painting schedule below shall receive the surface preparation, paints, and number of coats prescribed. Piping shall not be painted until the piping has been tested and approved. Explanatory information for use with the painting schedule is as follows.

3.4.2 Surfaces

Surfaces of fabricated and assembled items that are finish-painted by the manufacturer, or specified to be finish-painted under other sections of the specification, are exempted from the following schedule requirements for surface preparation and finish painting as required by this section.

3.4.3 Colors and Tints

Colors and tints shall match the respective color specimens selected by the Contracting Officer. Undercoats shall vary slightly from the color of the next coat.

3.4.4 Vent Risers

Plumbing vent risers shall be painted to match the roof.

3.5 SURFACES NOT TO BE PAINTED

The following listed items will not require painting: Interior Concrete Masonry Units, and Exterior Exposed Concrete.

3.6 CLEANING

Cloths and cotton waste that might constitute a fire hazard shall be placed in closed metal containers or destroyed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site or destroyed in an approved manner. Paint spots, oil, or stains upon adjacent surfaces shall be removed and the entire job left clean and acceptable.

3.7 PAINTING SCHEDULE

Products in painting schedule shall be by listed manufacturer or an approved equal.

<u>Surface</u>	<u>Surface preparation and Pretreatment</u>	<u>Prime/ Touch-up</u>	<u>1st Coat</u>	<u>2nd Coat</u>
Aluminum surfaces in contact with dissimilar metals	Clean with solvents	TT-P-645	TT-P-38	TT-P-38
Aluminum surfaces in contact with cement	Clean with solvent	Bituminous paint	TT-P-38	TT-P-38
Ferrous surfaces, unless otherwise specified, including piping, hangers and supports	As previously specified	PPG Rust Control	PPG Speed-hide ext., int. enamel	PPG-Speed hide ext., int. enamel
Metal trim doors, louvers, and ventilators	As previously specified	PPG Rust Control	PPG Speed-hide ext. int. enamel	None
Exterior masonry	As previously specified	TT-F-1098	TT-C-535	TT-C-535
Interior concrete floor	Steel Trowel	511 CST	511 CST	

Painted wood/plywood	As previously specified	PPG Quick Dry Enamel Undercoat	PPG Speed- hide ext., int. enamel	None
Stained wood siding, wood louvers, plywood panels, decking beams & trim, int. & ext.	As previously specified	None	Olympic Semi- transpare nt pigmented oil	Olympic Semi- transpare nt pigmented oil

Invitation No. DACW66-02-B-0008

DIVISIONS 10 THRU 15

(NOT USED)

DIVISION 10-TOC-1

DIVISION 16 - ELECTRICAL

SECTION 16070b

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SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

CORPS OF ENGINEERS, HUNTSVILLE ENGINEERING AND SUPPORT CENTER (CEHNC)

TI 809-04 (1998) Seismic Design for Buildings

1.2 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-01 Data

Equipment Requirements; GA

Copies of the design calculations with the detail drawings. Calculations shall be stamped by a registered engineer and shall verify the capability of structural members to which bracing is attached for carrying the load from the brace.

SD-04 Drawings

Equipment Requirements; FIO

Detail drawings along with catalog cuts, templates, and erection and installation details, as appropriate, for the items listed. Submittals shall be complete in detail; shall indicate thickness, type, grade, class of metal, and dimensions; and shall show construction details, reinforcement, anchorage, and installation with relation to the building construction.

1.3 SYSTEM DESCRIPTION

1.3.1 General Requirements

The requirements for seismic protection measures described in this section shall be applied to the electrical equipment and systems listed below.

1.3.2 Electrical Equipment

Electrical equipment shall include the following item to the extent required on the drawings or in other sections of these specifications:

Switchboards (Floor Mounted)

1.3.3 Electrical Systems

The following electrical systems shall be installed as required on the drawings and other sections of these specifications and shall be seismically protected in accordance with this specification: Gate control and power supply systems.

1.3.4 Conduits Requiring No Special Seismic Restraints

Seismic restraints may be omitted from electrical conduit less than 2-1/2 inches trade size. All other interior conduit, shall be seismically protected as specified.

1.4 EQUIPMENT REQUIREMENTS

1.4.1 Rigidly Mounted Equipment

The following specific items of equipment: Switchboards to be furnished under this contract shall be constructed and assembled to withstand the seismic forces specified in TI 809-04, Chapter 10. Each item of rigid electrical equipment shall be entirely located and rigidly attached on one side only of a building expansion joint. Piping, electrical conduit, etc., which cross the expansion joint shall be provided with flexible joints that are capable of accommodating displacements equal to the full width of the joint in both orthogonal directions.

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SECTION 16415b

ELECTRICAL WORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO LTS-3 (1994) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C39.1 (1981; R 1992) Requirements for Electrical Analog Indicating Instruments

ANSI C78.1 (1991; C78.1a; R 1996) Fluorescent Lamps - Rapid-Start Types - Dimensional and Electrical Characteristics

ANSI C78.1350 (1990) Electric Lamps - 400-Watt, 100-Volt, S51 Single-Ended High-Pressure Sodium Lamps

ANSI C78.1351 (1989) Electric Lamps - 250-Watt, 100-Volt S50 Single-Ended High-Pressure Sodium Lamps

ANSI C78.1352 (1990) Electric Lamps - 1000-Watt, 250-Volt, S52 Single-Ended High-Pressure Sodium Lamps

ANSI C78.1355 (1989) Electric Lamps - 150-Watt, 55-Volt S55 High-Pressure Sodium Lamps

ANSI C78.1375 (1996) 400-Watt, M59 Single-Ended Metal-Halide Lamps

ANSI C78.1376 (1996) 1000-Watt, M47 Metal-Halide Lamps

ANSI C78.2A (1991) 18 & 26- Watt, Compact Fluorescent Quad Tube Lamps

ANSI C78.2B (1992) 9 & 13-Watt, Compact Fluorescent Quad Tube Lamps

ANSI C82.1 (1997) Specifications for Fluorescent Lamp Ballasts

ANSI C82.4 (1992) Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 1 (1995) Hard-Drawn Copper Wire

ASTM B 8 (1999) Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

ASTM D 709 (1992; R 1997) Laminated Thermosetting Materials

CODE OF FEDERAL REGULATIONS (CFR)

47 CFR 18 Industrial, Scientific, and Medical Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C2 (1997) National Electrical Safety Code

IEEE C62.41 (1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits

IEEE ANSI/IEEE C136.13 (1992; R 1996) Roadway Lighting - Metal Brackets for Wood Poles

IEEE Std 81 (1983) Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part 1)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA AB 1 (1993) Molded Case Circuit Breakers and Molded Case Switches

NEMA FU 1 (1986) Low Voltage Cartridge Fuses

NEMA ICS 6 (1993) Industrial Control and Systems, Enclosures

NEMA OS 1 (1996) Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports

NEMA PB 1 (1995) Panelboards

NEMA RN 1 (1989) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

NEMA TC 2 (1990) Electrical Polyvinyl Chloride (PVC) Tubing (EPT) and Conduit (EPC-40 and EPC-80)

NEMA TC 6 (1990) PVC and ABS Plastic Utilities Duct for Underground Installation

NEMA WD 1 (1983; R 1989) General Requirements for Wiring Devices

NEMA WD 6 (1988) Wiring Devices - Dimensional Requirements

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

NFPA 101 (2000) Life Safety Code

UNDERWRITERS LABORATORIES (UL)

UL 1 (1993; Rev thru Jan 1995) Flexible Metal Conduit

UL 6 (1997) Rigid Metal Conduit

UL 20 (1995; Rev thru Oct 1998) General-Use Snap Switches

UL 50 (1995; Rev thru Oct 1997) Enclosures for Electrical Equipment

UL 67 (1993; Rev thru Nov 1995) Panelboards

UL 83 (1998) Thermoplastic-Insulated Wires and Cables

UL 98 (1994; Rev thru Jun 1998) Enclosed and Dead-Front Switches

UL 198B (1995) Class H Fuses

UL 198E (1988; Rev Jul 1988) Class R Fuses

UL 198H (1988; Rev thru Nov 1993) Class T Fuses

UL 360 (1996; Rev thru Oct 1997) Liquid-Tight Flexible Steel Conduit

UL 467 (1993; Rev thru Aug 1996) Grounding and Bonding Equipment

UL 486A (1997; Rev thru Dec 1998) Wire Connectors and Soldering Lugs for Use with Copper Conductors

UL 486C (1997; Rev thru Aug 1998) Splicing Wire Connectors

UL 486E (1994; Rev thru Feb 1997) Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors

UL 489	(1996; Rev thru Dec 1998) Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
UL 510	(1994; Rev thru Apr 1998) Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape
UL 512	(1993; R Dec 1995) Fuseholders
UL 514A	(1996; Rev Jul 1998) Metallic Outlet Boxes
UL 514B	(1997; Rev Oct 1998) Fittings for Cable and Conduit
UL 542	(1994; Rev thru Jul 1998) Lampholders, Starters, and Starter Holders for Fluorescent Lamps
UL 651	(1995; Rev thru Oct 1998) Schedule 40 and 80 Rigid PVC Conduit
UL 651A	(1995; Rev thru Apr 1998) Type EB and A Rigid PVC Conduit and HDPE Conduit
UL 854	(1996; Rev Apr 1998) Service-Entrance Cables
UL 869A	(1998) Reference Standard for Service Equipment
UL 943	(1993; Rev thru May 1998) Ground-Fault Circuit-Interrupters
UL 1029	(1994; Rev thru Dec 1997) High-Intensity-Discharge Lamp Ballasts
UL 1449	(1996; Rev thru Oct 1998) Transient Voltage Surge Suppressors
UL 1570	(1995; Rev thru Jun 1997) Fluorescent Lighting Fixtures
UL 1572	(1995; Rev thru Jun 1997) High Intensity Discharge Lighting Fixtures
UL 1660	(1994; Rev Apr 1998) Liquid-Tight Flexible Nonmetallic Conduit
UL Elec Const Dir	(1998) Electrical Construction Equipment Directory

1.2 GENERAL

1.2.1 Rules

The installation shall conform to the requirements of NFPA 70 and NFPA 101, unless more stringent requirements are indicated or shown.

1.2.2 Coordination

The drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall become familiar with all details of the work and verify all dimensions in the field so that the outlets and equipment shall be properly located and readily accessible. Lighting fixtures, outlets, and other equipment and materials shall be carefully coordinated with mechanical or structural features prior to installation and positioned according to architectural reflected ceiling plans; otherwise, lighting fixtures shall be symmetrically located according to the room arrangement when uniform illumination is required, or asymmetrically located to suit conditions fixed by design and shown. Raceways, junction and outlet boxes, and lighting fixtures shall not be supported from sheet metal roof decks. If any conflicts occur necessitating departures from the drawings, details of and reasons for departures shall be submitted and approved prior to implementing any change. The Contractor shall coordinate the electrical requirements of the mechanical work and provide all power related circuits, wiring, hardware and structural support, even if not shown on the drawings.

1.2.3 Special Environments

1.2.3.1 Weatherproof Locations

Wiring, Fixtures, and equipment in designated locations shall conform to NFPA 70 requirements for installation in damp or wet locations.

1.2.4 Standard Products

Material and equipment shall be a standard product of a manufacturer regularly engaged in the manufacture of the product and shall essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening.

1.2.5 Nameplates

1.2.5.1 Identification Nameplates

Major items of electrical equipment and major components shall be permanently marked with an identification name to identify the equipment by type or function and specific unit number as indicated. Designation of motors shall coincide with their designation in the motor control center or panel. Unless otherwise specified, identification nameplates shall be made of laminated plastic in accordance with ASTM D 709 with black outer layers and a white core. Edges shall be chamfered. Plates shall be fastened with black-finished round-head drive screws, except motors, or approved nonadhesive metal fasteners. When the nameplate is to be installed on an irregular-shaped object, the Contractor shall devise an approved support suitable for the application and ensure the proper installation of the supports and nameplates. In all instances, the nameplate shall be installed in a conspicuous location. At the option of the Contractor, the equipment manufacturer's standard embossed nameplate material with black paint-filled letters may be furnished in lieu of laminated plastic. The front of each panelboard, motor control center, switchgear, and switchboard shall have a nameplate to indicate the phase letter, corresponding color and arrangement of the phase conductors. The following equipment, as a minimum, shall be provided with identification nameplates:

Minimum 1/4 inch
High Letters

Minimum 1/8 inch
High Letters

Panelboards
Transformers
Equipment Enclosures

Control Power Transformers
Control Devices

1.2.6 As-Built Drawings

Following the project completion or turnover, within 30 days the Contractor shall furnish 2 sets of as-built drawings to the Contracting Officer.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330b SUBMITTAL PROCEDURES:

SD-01 Data

Manufacturer's Catalog; GA

Data composed of catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

Material, Equipment, and Fixture Lists; GA

A complete itemized listing of equipment and materials proposed for incorporation into the work. Each entry shall include an item number, the quantity of items proposed, and the name of the manufacturer of each item.

Installation Procedures; FIO

Installation procedures for rotating equipment, transformers, switchgear, battery systems, voltage regulators, and grounding resistors. Procedures shall include diagrams, instructions, and precautions required to install, adjust, calibrate, and test devices and equipment.

As-Built Drawings; FIO

The as-built drawings shall be a record of the construction as installed. The drawings shall include all the information shown on the contract drawings, deviations, modifications, and changes from the contract drawings, however minor. The as-built drawings shall be kept at the job site and updated daily. The as-built drawings shall be a full-sized set of prints marked to reflect all deviations, changes, and modifications. The as-built drawings shall be complete and show the location, size, dimensions, part identification, and other information. Additional sheets may be added. The as-built drawings shall be jointly inspected for accuracy and completeness by the Contractor's quality control

representative and by the Contracting Officer prior to the submission of each monthly pay estimate. Upon completion of the work, the Contractor shall submit three full sized sets of the marked prints to the Contracting Officer for approval. If upon review, the as-built drawings are found to contain errors and/or omissions, they will be returned to the Contractor for correction. The Contractor shall correct and return the as-built drawings to the Contracting Officer for approval within ten calendar days from the time the drawings are returned to the Contractor.

Onsite Tests; GA

A detailed description of the Contractor's proposed procedures for on-site tests.

SD-04 Drawings

Interior Electrical Equipment; GA

Detail drawings consisting of equipment drawings, illustrations, schedules, instructions, diagrams, and other information necessary to define the installation. Detail drawings shall show the rating of items and systems and how the components of an item and system are assembled, function together, and how they will be installed on the project. Data and drawings for component parts of an item or system shall be coordinated and submitted as a unit. Data and drawings shall be coordinated and included in a single submission. Multiple submissions for the same equipment or system are not acceptable except where prior approval has been obtained from the Contracting Officer. In such cases, a list of data to be submitted later shall be included with the first submission. Detail drawings shall show physical arrangement, construction details, connections, finishes, materials used in fabrication, provisions for conduit or busway entrance, access requirements for installation and maintenance, physical size, electrical characteristics, foundation and support details, and equipment weight. Drawings shall be drawn to scale and/or dimensioned. Optional items shall be clearly identified as included or excluded. Detail drawings shall as a minimum include:

- a. Main distribution panel.
- b. Single-line electrical diagrams including primary, metering, control wiring and control logic.

Electrical drawings including single-line and three-line diagrams, and schematics or elementary diagrams of each electrical system; internal wiring and field connection diagrams of each electrical device when published by the manufacturer; wiring diagrams of cabinets, panels, units, or separate mountings; interconnection diagrams that show the wiring between separate components of assemblies; field connection diagrams that show the termination of wiring routed between separate items of equipment; internal wiring diagrams of equipment showing wiring as actually provided for this project. Field wiring connections, circuit ratings, and conductor sizes shall be clearly identified.

If departures from the contract drawings are deemed necessary by the Contractor, complete details of such departures, including changes in related portions of the project and the reasons why, shall be submitted with the detail drawings. Approved departures shall be made at no additional cost to the Government.

SD-09 Reports

Factory Test Reports; FIO

Six copies of the information described below in 8 1/2 x 11 inch binders having a minimum of 5 rings from which material may readily be removed and replaced, including a separate section for each test. Sections shall be separated by dividers with tabs.

- a. A copy of measurements taken and annotated test plan.
- b. The dates of testing.
- c. The equipment and values to be verified.
- d. The test results, signed and dated.
- e. A description of adjustments made.

SD-13 Certificates

Materials and Equipment; GA

The label or listing of the Underwriters Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements will be accepted. However, materials and equipment installed in hazardous locations must bear the UL label unless the data submitted from other testing agency is specifically approved in writing by the Contracting Officer. Items which are required to be listed and labeled in accordance with Underwriters Laboratories must be affixed with a UL label that states that it is UL listed. No exceptions or waivers will be granted to this requirement. Materials and equipment will be approved based on the manufacturer's published data.

For other than equipment and materials specified to conform to UL publications, a manufacturer's statement indicating complete compliance with the applicable standard of the American Society for Testing and Materials, National Electrical Manufacturers Association, or other commercial standard, is acceptable.

1.4 WORKMANSHIP

Materials and equipment shall be installed by, or under the immediate supervision of an electrician licensed in the State of Missouri, and in accordance with NFPA 70, recommendations of the manufacturer, and as shown.

Lockout-tagout procedures shall be used, especially for functional gate controls.

1.5 SEISMIC REQUIREMENTS

Seismic details shall conform to Section 16070b SEISMIC PROTECTION FOR ELECTRICAL EQUIPMENT.

PART 2 PRODUCTS

Products shall conform to the respective publications and other requirements specified below. Materials and equipment not listed below shall be as specified elsewhere in this section. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

2.1 CABLES AND WIRES

Conductors No. 8 AWG and larger diameter shall be stranded. Conductors No. 10 AWG and smaller diameter shall be solid, except that conductors for remote control, alarm, and signal circuits, classes 1, 2, and 3, shall be stranded unless specifically indicated otherwise. Conductor sizes and ampacities shown are based on copper, unless indicated otherwise. All conductors shall be copper.

2.1.1 Equipment Manufacturer Requirements

When manufacturer's equipment requires copper conductors at the terminations or requires copper conductors to be provided between components of equipment, provide copper conductors or splices, splice boxes, and other work required to meet manufacturer's requirements.

2.2 ALUMINUM CONDUCTORS

Aluminum conductors shall not be used.

2.2.1 Insulation

Unless indicated otherwise, or required by NFPA 70, power and lighting wires shall be 600-volt, Type THWN, THHN, or THW conforming to UL 83, except that grounding wire may be type TW conforming to UL 83; remote-control and signal circuits shall be Type TW, THW or TF, conforming to UL 83. Where lighting fixtures require 90-degree Centigrade (C) conductors, provide only conductors with 90-degree C insulation or better.

2.2.2 Bonding Conductors

ASTM B 1, solid bare copper wire for sizes No. 8 AWG and smaller diameter; ASTM B 8, Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

2.2.3 Service Entrance Cables

Service entrance (SE) type and underground service entrance (USE) type cables, UL 854.

2.3 SIGNAL CABLE

Size, use, location, and number of pairs shall be as shown on drawings. Conductors shall be multiple twisted pairs of tinned copper, each pair individually wrapped with aluminum-polyester shield with No. 22 AWG stranded tinned copper drain wire inside. Conductor insulation shall be 0.33 mm thickness of polypropylene compound, rated 250 volts. Overall jacket shall be 1.02 mm thickness of black high-density polyethylene, rated for direct burial application. Individual conductors shall be color coded, manufacturer's standard. Acceptable products include Belden Trade No. 9883.

2.4 TRANSIENT VOLTAGE SURGE PROTECTION

Transient voltage surge suppressors shall be provided as indicated. Surge suppressors shall meet the requirements of IEEE C62.41 and be UL listed and labeled as having been tested in accordance with UL 1449. Surge suppressor ratings shall be as indicated. Fuses shall not be used as surge suppression.

2.5 CIRCUIT BREAKERS

2.5.1 Molded-Case Circuits Breakers

Molded-case circuit breakers shall conform to NEMA AB 1 and UL 489. Circuit breakers may be installed in panelboards, switchboards, enclosures, motor control centers, or combination motor controllers. Where used as service disconnecting device, circuit breaker shall be rated and listed accordingly.

2.5.1.1 Construction

Circuit breakers shall be suitable for mounting and operating in any position. Lug shall be listed for copper conductors only in accordance with UL 486E. Single-pole circuit breakers shall be full module size with not more than one pole per module. Multi-pole circuit breakers shall be of the common-trip type having a single operating handle such that an overload or short circuit on any one pole will result in all poles opening simultaneously. Sizes of 100 amperes or less may consist of single-pole breakers permanently factory assembled into a multi-pole unit having an internal, mechanical, nontamperable common-trip mechanism and external handle ties. All circuit breakers shall have a quick-make, quick-break overcenter toggle-type mechanism, and the handle mechanism shall be trip-free to prevent holding the contacts closed against a short-circuit or sustained overload. All circuit breaker handles shall assume a position between "ON" and "OFF" when tripped automatically. All ratings shall be clearly visible.

2.5.1.2 Ratings

Voltage ratings shall be not less than the applicable circuit voltage. The interrupting rating of the circuit breakers shall be full load circuit current short-circuit current at the line terminals of the circuit breaker and correspond to the UL listed integrated short-circuit current rating specified for the panelboards and switchboards. Molded-case circuit breakers shall have nominal voltage ratings, maximum continuous-current ratings, and maximum short-circuit interrupting ratings in accordance with NEMA AB 1. Ratings shall be coordinated with system X/R ratio.

2.5.1.3 Thermal-Magnetic Trip Elements

Thermal magnetic circuit breakers shall be provided as shown. Automatic operation shall be obtained by means of thermal-magnetic tripping devices located in each pole providing inverse time delay and instantaneous circuit protection.

2.5.2 Ground Fault Circuit Interrupters

UL 943. Breakers equipped with ground fault circuit interrupters shall have ground fault class, interrupting capacity, and voltage and current ratings as indicated.

2.6 CONDUIT AND TUBING

2.6.1 Flexible Conduit, Steel and Plastic

General-purpose type, UL 1; liquid tight, UL 360, and UL 1660.

2.6.2 PVC Coated Rigid Steel Conduit

NEMA RN 1.

2.6.3 Rigid Metal Conduit

UL 6.

2.6.4 Rigid Plastic Conduit

NEMA TC 2, UL 651 and UL 651A.

2.7 CONDUIT AND DEVICE BOXES AND FITTINGS

Connection to exterior boxes shall use watertight fittings.

2.7.1 Boxes, Metallic Outlet

NEMA OS 1 and UL 514A.

2.7.2 Boxes, Switch (Enclosed), Surface-Mounted

UL 98.

2.7.3 Fittings for Conduit and Outlet Boxes

UL 514B.

2.7.4 Fittings, PVC, for Use with Rigid PVC Conduit and Tubing

UL 514B.

2.8 CONDUIT COATINGS PLASTIC RESIN SYSTEM

NEMA RN 1, Type A-40.

2.9 UNDERGROUND CONDUIT AND DUCTS

Duct lines shall be nonencased direct-burial, thick-wall type.

2.9.1 Nonmetallic Ducts, Direct Burial

UL 651 Schedule 40 or NEMA TC 6 Type DB.

2.10 CONNECTORS, WIRE PRESSURE

2.10.1 For Use With Copper Conductors

UL 486A.

2.11 ELECTRICAL GROUNDING AND BONDING EQUIPMENT

UL 467.

2.11.1 Ground Rods

Ground rods shall be of copper-clad steel conforming to UL 467 not less than 5/8 inch in diameter by 20 feet in length of the sectional type driven full length into the earth.

2.11.2 Ground Bus

The ground bus shall be bare conductor or flat copper in one piece, if practicable, and bonded according to the NEC and other safeguards.

2.12 ENCLOSURES

NEMA ICS 6, unless otherwise specified.

2.12.1 Cabinets and Boxes

Cabinets and boxes with volume greater than 100 cubic inches shall be in accordance with UL 50, hot-dip, zinc-coated, if sheet steel.

2.12.2 Circuit Breaker Enclosures

UL 489.

2.13 PULLBOXES

Pullboxes shall be as indicated. Strength of pullboxes and their frames and covers shall conform to the requirements of IEEE C2. Pullbox and handhole covers in sidewalks, and turfed areas shall be of the same material as the box. Concrete pullboxes shall consist of precast reinforced concrete boxes, extensions, bases, and covers.

2.14 LIGHTING FIXTURES, LAMPS, BALLASTS, EMERGENCY EQUIPMENT, CONTROLS AND ACCESSORIES

The following specifications which include Standard Drawing 40-06-04 sheets enclosed as an integral part of these specifications, are supported and supplemented by information and details on the drawings. Additional fixtures, if shown, shall conform to this specification. Illustrations

shown are indicative of the general type desired and are not intended to restrict selection to fixtures of any particular manufacturer. Fixtures of similar designs and equivalent energy efficiency, light distribution and brightness characteristics, and of equal finish and quality will be acceptable if approved. Lamps, lampholders, ballasts, transformers, electronic circuitry and other lighting system components shall be constructed according to industry standards. Equipment shall be tested and listed by a recognized independent testing laboratory for the expected installation conditions. Equipment shall conform to the standards listed below.

2.14.1 Lamps

Lamps shall be constructed to operate in the specified fixture, and shall function without derating life or output as listed in published data. Lamps shall meet the requirements of the Energy Policy Act of 1992.

- a. Fluorescent lamps shall have color temperature of 3,500 degrees Kelvin. They shall be designed to operate with the ballasts and circuitry of the fixtures in which they will be used. Fluorescent lamps, including spares, shall be manufactured by one manufacturer to provide for color and performance consistency. Fluorescent lamps shall comply with ANSI C78.1. Fluorescent tube lamp efficiencies shall meet or exceed the following requirements.

T8, 32 watts	(4' lamp)	2800 lumens
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(1) Linear fluorescent lamps, unless otherwise indicated, shall be 4 feet long 32 watt T8, 265 mA, with minimum CRI of 75. Lamps of other lengths or types shall be used only where specified or shown. Lamps shall deliver rated life when operated on rapid start ballasts.

(2) Small compact fluorescent lamps shall be twin, double, or triple tube configuration as shown with bi-pin or four-pin snap-in base and shall have minimum CRI of 85. They shall deliver rated life when operated on ballasts as shown. 9 and 13 watt double tube lamps shall comply with ANSI C78.2B. 18 and 26 watt double tube lamps shall comply with ANSI C78.2A. Minimum starting temperature shall be 32 degrees F for twin tube lamps and for double and triple twin tube lamps without internal starter; and 15 degrees F for double and triple twin tube lamps with internal starter.

- c. High intensity discharge lamps, including spares, shall be manufactured by one manufacturer in order to provide color and performance consistency. High intensity discharge lamps shall be designed to operate with the ballasts and circuitry of the fixtures in which they will be used and shall have wattage, shape and base as shown. High intensity discharge lamps, unless otherwise shown, shall have medium or mogul screw base and minimum starting temperature of -20 degrees F. Metal halide lamps, unless otherwise shown, shall have minimum CRI of 65; color temperature of 4,300 degrees Kelvin; shall be -BU configuration if used in base-up position; and shall be -H or high output configuration if used in horizontal position. Lamps shall comply with all applicable ANSI C78.1350, ANSI C78.1351, ANSI C78.1352, ANSI C78.1355, ANSI C78.1375, and ANSI C78.1376.

2.14.2 Ballasts and Transformers

Ballasts or transformers shall be designed to operate the designated lamps within their optimum specifications, without derating the lamps. Lamp and ballast combinations shall be certified as acceptable by the lamp manufacturer.

- a. Fluorescent ballasts shall comply with ANSI C82.1 and shall be mounted integrally within fluorescent fixture housing unless otherwise shown. Ballasts shall have maximum current crest factor of 1.7; high power factor; Class A sound rating; maximum operating case temperature of 77 degrees F above ambient; and shall be rated Class P. Unless otherwise indicated, the minimum number of ballasts shall be used to serve each individual fixture. A single ballast may be used to serve multiple fixtures if they are continuously mounted, identically controlled and factory manufactured for that installation with an integral wireway.

(1) Compact fluorescent ballasts shall comply with IEEE C62.41 Category A transient voltage variation requirements and shall be mounted integrally within compact fluorescent fixture housing unless otherwise shown. Ballasts shall have minimum ballast factor of 0.95; maximum current crest factor of 1.6; high power factor; maximum operating case temperature of 77 degrees F above ambient; shall be rated Class P; and shall have a sound rating of Class A. Ballasts shall meet FCC Class A specifications for EMI/RFI emissions. Ballasts shall operate from nominal line voltage of 120 volts at 60 Hz and maintain constant light output over a line voltage variation of ± 10 percent. Ballasts shall have an end-of-lamp-life detection and shut-down circuit. Ballasts shall be UL listed and shall contain no PCBs. Ballasts shall contain potting to secure PC board, provide lead strain relief, and provide a moisture barrier.

(2) Electronic fluorescent ballasts shall comply with 47 CFR 18 for electromagnetic interference. Ballasts shall withstand line transients per IEEE C62.41, Category A. Ballasts shall have total harmonic distortion between 10 and 20 percent; minimum frequency of 20,000Hz; filament voltage between 2.5 and 4.5 volts; maximum starting inrush current of 20 amperes; and shall comply with the minimum Ballast Efficiency Factors shown in the table below. Minimum starting temperature shall be 32 degrees F. Ballasts shall carry a manufacturer's full warranty of three years, including a minimum \$10 labor allowance per ballast.

ELECTRONIC FLUORESCENT BALLAST EFFICACY FACTORS

LAMP TYPE	TYPE OF STARTER & LAMP	NOMINAL OPERATIONAL VOLTAGE	NUMBER OF LAMPS	MINIMUM BALLAST EFFICACY FACTOR
32W T8	rapid	120 or 277 V	1	2.54
	start		2	1.44
	linear &		3	0.93

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- b. High intensity discharge ballasts shall comply with UL 1029 and, if multiple supply types, with ANSI C82.4. Ballasts shall have minimum ballast factor of 0.9; high power factor; Class A sound rating; and maximum operating case temperature of 77 degrees F above ambient.

(1) Electronic high intensity discharge ballasts shall be constant wattage autotransformer type; shall have less than 10 percent ballast loss; shall have total harmonic distortion between 10 and 20 percent; and shall have a minimum starting temperature of 0 degrees F.

(2) Magnetic high intensity discharge ballasts shall have a minimum starting temperature of 0 degrees F.

2.14.3 Fixtures

Fixtures shall be in accordance with the size, shape, appearance, finish, and performance shown. Unless otherwise indicated, lighting fixtures shall be provided with housings, junction boxes, wiring, lampholders, mounting supports, trim, hardware and accessories for a complete and operable installation. Recessed housings shall be minimum 20 gauge cold rolled or galvanized steel as shown. Extruded aluminum fixtures shall have minimum wall thickness of 0.125 inches. Plastic lenses shall be 100% virgin acrylic or as shown. Glass lenses shall be tempered. Heat resistant glass shall be borosilicate type. Conoid recessed reflector cones shall be Alzak with clear specular low iridescent finish.

- a. Fluorescent fixtures shall comply with UL 1570. Fixtures shall be plainly marked for proper lamp and ballast type to identify lamp diameter, wattage, color and start type. Marking shall be readily visible to service personnel, but not visible from normal viewing angles. Integral ballast and wireway compartments shall be easily accessible without the use of special tools. Housings shall be constructed to include grounding necessary to start the lamps. Open fixtures shall be equipped with a sleeve, wire guard, or other positive means to prevent lamps from falling. Medium bi-pin lampholders shall be twist-in type with positive locking position. Long compact fluorescent fixtures and fixtures utilizing U-bend lamps shall have clamps or secondary lampholders to support the free ends of the lamps.
- b. High intensity discharge fixture shall comply with UL 1572. Reflectors shall be anodized aluminum. Fixtures for horizontal lamps shall have position oriented lampholders. Lampholders shall be pulse-rated to 5,000 volts. Fixtures indicated as classified or rated for hazardous locations or special service shall be designed and independently tested for the environment in which they are installed. Recessed lens fixtures shall have extruded aluminum lens frames. Ballasts shall be integral to fixtures and shall be accessible without the use of special tools. Remote ballasts shall be encased and potted. Lamps shall be shielded from direct view with a UV absorbing material such as tempered glass, and shall be

circuited through a cut-off switch which will shut off the lamp circuit if the lens is not in place.

2.14.4 Lampholders, Starters, and Starter Holders

UL 542

2.15 POLES

Metal poles shall be the pole manufacturer's standard design for supporting the number of fixtures indicated. Poles shall be designed for a wind velocity of 100 mph at the base of the pole, for a wind gust factor of 1.3, and for the height and drag factors recommended by AASHTO LTS-3. The effective projected area of luminaires and other pole-mounted devices shall be taken into account in pole design. Poles shall have grounding provisions. The type of pole shaft material provided shall not be mixed on any project. Grounding connection shall be provided near the bottom of each metal pole. Scratched, stained, chipped, or dented poles shall not be installed.

2.15.1 Aluminum Poles

Aluminum poles and brackets for exterior lighting shall have a dark anodic bronze finish to match fixtures and shall not be painted. Manufacturer's standard provision shall be made for protecting the finish during shipment and installation. Minimum protection shall consist of spirally wrapping each pole shaft with protective paper secured with tape, and shipping small parts in boxes.

- a. Shafts shall be square and of seamless construction. The wall thickness shall be at least 0.188 inch. Exterior surfaces shall be free of protuberances, dents, cracks, and discoloration. Material for shafts shall be 6063 aluminum alloy; after fabrication, the alloy shall have a T6 temper. Tops of shafts shall be fitted with a tapered cover. Bases shall be anchor bolt mounted, made of cast aluminum alloy 356-T6, and shall be machined to receive the lower end of shafts. Joints between shafts and bases shall be welded. Bases shall be hinged with four holes, spaced 90 degrees apart, for anchorage.
- b. Hardware, except anchor bolts, shall be either 2024-T4 anodized aluminum alloy or stainless steel.

2.15.2 Bracket Arms

2.15.2.1 On Aluminum Poles

Poles shall be provided with bracket arms of the style and of the length indicated on drawings. Bracket arms shall conform to the design of the pole provided. The bracket arms shall be capable of supporting the equipment to be mounted on it with the maximum wind loading encountered at the site. Strength of bracket arms shall be in accordance with IEEE ANSI/IEEE C136.13.

2.15.2.2 Floodlight Brackets

Floodlight brackets shall be coordinated with the floodlight support provided.

2.16 LOW-VOLTAGE FUSES AND FUSEHOLDERS

2.16.1 Fuses, Low Voltage Cartridge Type

NEMA FU 1.

2.16.2 Fuses, Class H

UL 198B.

2.16.3 Fuses, Class R

UL 198E.

2.16.4 Fuses, Class T

UL 198H.

2.16.5 Fuseholders

UL 512.

2.17 INSTRUMENTS, ELECTRICAL INDICATING

ANSI C39.1.

2.18 PANELBOARDS

Dead-front construction, NEMA PB 1 and UL 67.

2.19 RECEPTACLES

2.19.1 Heavy Duty Grade

NEMA WD 1. Devices shall conform to all requirements for heavy duty receptacles.

2.19.2 Ground Fault Interrupters

UL 943, Class A or B.

2.19.3 NEMA Standard Receptacle Configurations

NEMA WD 6.

- a. Single and Duplex, 20-Ampere, 125 Volt non-locking: NEMA type 5-20R.
- b. 20-Ampere, 250 Volt, Two-pole, 3-wire grounding, non-locking: NEMA type 6-20R.

2.20 SERVICE ENTRANCE EQUIPMENT

UL 869A.

2.21 SPLICE, CONDUCTOR

UL 486C.

2.22 SNAP SWITCHES

UL 20.

2.23 TAPES

2.23.1 Plastic Tape

UL 510.

2.24 TRANSFORMERS

Single- and three-phase transformers shall have two windings per phase. Full-capacity standard NEMA taps shall be provided in the primary windings of transformers unless otherwise indicated. Three-phase transformers shall be configured with delta-wye windings, except as indicated. "T" connections may be used for transformers rated 15 kVA or below. Transformers supplying non-linear loads shall be UL listed as suitable for supplying such loads with a total K-factor not to exceed K-9 and have neutrals sized for 200 percent of rated current.

2.24.1 Transformers, Dry-Type

Transformers shall have 220 degrees C insulation system for transformers 15 kVA and greater, and shall have 180 degrees C insulation system for transformers rated 10 kVA and less, with temperature rise not exceeding 150 degrees C under full-rated load in maximum ambient temperature of 40 degrees C. Transformer of 150 degrees C temperature rise shall be capable of carrying continuously 100 percent of nameplate kVA without exceeding insulation rating.

a. 600 Volt or Less Primary:

NEMA ST 20, UL 506, general purpose, dry-type, self-cooled, sealed. Transformers shall be provided in NEMA 1 enclosure. Transformers shall be quiet type with maximum sound level at least 3 decibels less than NEMA standard level for transformer ratings indicated.

2.25 WIRING DEVICES

NEMA WD 1 for wiring devices, and NEMA WD 6 for dimensional requirements of wiring devices.

2.26 ELECTRICAL SERVICE

City of New Madrid, the local power utility, will provide construction and permanent power to the site. Their services include the design, furnishing and installation of the overhead primary tap, transformer pole and equipment, and service drop conductors. Contractor shall provide riser pole with disconnect as indicated.

PART 3 EXECUTION

3.1 GROUNDING

Grounding shall be in conformance with NFPA 70, the contract drawings, and the following specifications.

3.1.1 Ground Rods

The resistance to ground shall be measured using the fall-of-potential method described in IEEE Std 81. The maximum resistance of a driven ground rod shall not exceed 25 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, 2 additional rods not less than 6 feet on centers, or if sectional type rods are used, 2 additional sections may be coupled and driven with the first rod.

3.1.2 Ground Bus

Ground bus shall be provided in the electrical equipment rooms as indicated. Noncurrent-carrying metal parts of electrical equipment shall be effectively grounded by bonding to the ground bus. The ground bus shall be bonded to both the entrance ground, and to a ground rod or rods as specified above having the upper ends terminating approximately 4 inches above the floor. Connections and splices shall be of the brazed, welded, bolted, or pressure-connector type, except that pressure connectors or bolted connections shall be used for connections to removable equipment. Connections shall be bolted type in lieu of thermoweld, so they can be changed as required by additions and/or alterations.

3.1.3 Grounding Conductors

Equipment grounding bars shall be provided in all panelboards. The equipment grounding conductor shall be carried back to the service entrance grounding connection or separately derived grounding connection. All equipment grounding conductors, including metallic raceway systems used as such, shall be bonded or joined together in each wiring box or equipment enclosure. Metallic raceways and grounding conductors shall be checked to assure that they are wired or bonded into a common junction. Metallic boxes and enclosures, if used, shall also be bonded to these grounding conductors by an approved means per NFPA 70. When switches, or other utilization devices are installed, any designated grounding terminal on these devices shall also be bonded to the equipment grounding conductor junction with a short jumper. The ends of all conduits in panelboards shall have grounding bushing bonded to the ground bus.

3.2 WIRING METHODS

Wiring shall conform to NFPA 70, the contract drawings, and the following specifications. Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid zinc-coated steel conduit, rigid plastic conduit, electrical metallic tubing, and intermediate metal conduit. Wire fill in conduits shall be based on NFPA 70 for the type of conduit and wire insulations specified.

3.2.1 Conduit and Tubing Systems

Conduit and tubing systems shall be installed as indicated. Conduit sizes shown are based on use of copper conductors with insulation types as described in paragraph WIRING METHODS. Minimum size of raceways shall be 1/2 inch. Only metal conduits will be permitted when conduits are required for shielding or other special purposes indicated, or when required by conformance to NFPA 70. Nonmetallic conduit and tubing may be used in damp, wet or corrosive locations when permitted by NFPA 70 and the conduit or tubing system is provided with appropriate boxes, covers, clamps, screws or other appropriate type of fittings. Electrical metallic tubing (EMT) may be installed only within buildings. EMT shall not be installed in damp or wet locations, or the air space of exterior masonry cavity walls. Bushings, manufactured fittings or boxes providing equivalent means of protection shall be installed on the ends of all conduits and shall be of the insulating type, where required by NFPA 70. Only UL listed adapters shall be used to connect EMT to rigid metal conduit, cast boxes, and conduit bodies. Except as otherwise specified, IMC may be used as an option for rigid steel conduit in areas as permitted by NFPA 70. Raceways shall be concealed within finished walls, ceilings, and floors unless otherwise shown. Raceways crossing structural expansion joints or seismic joints shall be provided with suitable expansion fittings or other suitable means to compensate for the building expansion and contraction and to provide for continuity of grounding.

3.2.1.1 Pull Wires

A pull wire shall be inserted in each empty raceway in which wiring is to be installed if the raceway is more than 50 feet in length and contains more than the equivalent of two 90-degree bends, or where the raceway is more than 150 feet in length. The pull wire shall be of No. 14 AWG zinc-coated steel, or of plastic having not less than 200 pounds per square inch tensile strength. Not less than 10 inches of slack shall be left at each end of the pull wire.

3.2.1.2 Conduit Stub-Ups

Where conduits are to be stubbed up through concrete floors, a short elbow shall be installed below grade to transition from the horizontal run of conduit to a vertical run. A conduit coupling fitting, threaded on the inside shall be installed, to allow terminating the conduit flush with the finished floor. Wiring shall be extended in rigid threaded conduit to equipment, except that where required, flexible conduit may be used 6 inches above the floor. Empty or spare conduit stub-ups shall be plugged flush with the finished floor with a threaded, recessed plug.

3.2.1.3 Below Slab-on-Grade or in the Ground

Electrical wiring below slab-on-grade shall be protected by a conduit system. Conduit passing vertically through slabs-on-grade shall be rigid steel or IMC. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field wrapped with 0.010 inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system.

3.2.1.4 Installing in Slabs Including Slabs on Grade

Conduit installed in slabs-on-grade shall be rigid steel or IMC. Conduits shall be installed as close to the middle of concrete slabs as practicable

without disturbing the reinforcement. Outside diameter shall not exceed 1/3 of the slab thickness and conduits shall be spaced not closer than 3 diameters on centers except at cabinet locations where the slab thickness shall be increased as approved by the Contracting Officer. Where conduit is run parallel to reinforcing steel, the conduit shall be spaced a minimum of one conduit diameter away but not less than one inch from the reinforcing steel.

3.2.1.5 Changes in Direction of Runs

Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment shall be prevented during the course of construction. Clogged raceways shall be cleared of obstructions or shall be replaced.

3.2.1.6 Supports

Metallic conduits and tubing, and the support system to which they are attached, shall be securely and rigidly fastened in place to prevent vertical and horizontal movement at intervals of not more than 10 feet and within 3 feet of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, beam clamps, or ceiling trapeze. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structure. Loads shall not be applied to joist bridging. Attachment shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and provided with lock washers and nuts may be used in lieu of expansion bolts or machine screws. Raceways or pipe straps shall not be welded to steel structures. Cutting the main reinforcing bars in reinforced concrete beams or joists shall be avoided when drilling holes for support anchors. Holes drilled for support anchors, but not used, shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Raceways shall not be supported using wire or nylon ties. Raceways shall be independently supported from the structure. Upper raceways shall not be used as a means of support for lower raceways. Supporting means shall not be shared between electrical raceways and mechanical piping or ducts. Cables and raceways shall not be supported by ceiling grids. Except where permitted by NFPA 70, wiring shall not be supported by ceiling support systems. Conduits shall be fastened to sheet-metal boxes and cabinets with two locknuts where required by NFPA 70, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered. Additional support for horizontal runs is not required when EMT rests on steel stud cutouts.

3.2.1.7 Exposed Raceways

Exposed raceways shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings.

Raceways under raised floors and above accessible ceilings shall be considered as exposed installations in accordance with NFPA 70 definitions.

3.2.2 Cables and Conductors

Installation shall conform to the requirements of NFPA 70. Covered, bare or insulated conductors of circuits rated over 600 volts shall not occupy the same equipment wiring enclosure, cable, or raceway with conductors of circuits rated 600 volts or less.

3.2.2.1 Sizing

Unless otherwise noted, all sizes are based on copper conductors and the insulation types indicated. Sizes shall be not less than indicated. Branch-circuit conductors shall be not smaller than No. 12 AWG. Conductors for branch circuits of 120 volts more than 100 feet long, from panel to load center, shall be no smaller than No. 10 AWG. Class 1 remote control and signal circuit conductors shall be not less than No. 14 AWG. Class 2 remote control and signal circuit conductors shall be not less than No. 16 AWG. Class 3 low-energy, remote-control and signal circuits shall be not less than No. 22 AWG.

3.2.2.2 Use of Aluminum Conductors in Lieu of Copper

Aluminum conductors shall not be used.

3.2.2.3 Cable Splicing

Splices shall be made in an accessible location. Crimping tools and dies shall be approved by the connector manufacturer for use with the type of connector and conductor.

- a. Copper Conductors, 600 Volt and Under: Splices in conductors No. 10 AWG and smaller diameter shall be made with an insulated, pressure-type connector. Splices in conductors No. 8 AWG and larger diameter shall be made with a solderless connector and insulated with tape or heat-shrink type insulating material equivalent to the conductor insulation.

3.2.2.4 Conductor Identification and Tagging

Power, control, and signal circuit conductor identification shall be provided within each enclosure where a tap, splice, or termination is made. Phase conductors of low voltage power circuits shall be identified by color coding. Phase identification by a particular color shall be maintained continuously for the length of a circuit, including junctions.

- a. Color coding shall be provided for service, feeder, branch, and ground conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in the same raceway or box, other neutral shall be white with colored (not green) stripe. The color coding for 3-phase and single-phase low voltage systems shall be as follows:

120/208-volt, 3-phase: Black(A), red(B), and blue(C).
277/480-volt, 3-phase: Brown(A), orange(B), and yellow(C).

120/240-volt, 1-phase: Black and red.

- b. Conductor phase and voltage identification shall be made by color-coded insulation for all conductors smaller than No. 6 AWG. For conductors No. 6 AWG and larger, identification shall be made by color-coded insulation, or conductors with black insulation may be furnished and identified by the use of half-lapped bands of colored electrical tape wrapped around the insulation for a minimum of 3 inches of length near the end, or other method as submitted by the Contractor and approved by the Contracting Officer.
- c. Control and signal circuit conductor identification shall be made by color-coded insulated conductors, plastic-coated self-sticking printed markers, permanently attached stamped metal foil markers, or equivalent means as approved. Control circuit terminals of equipment shall be properly identified. Terminal and conductor identification shall match that shown on approved detail drawings. Hand lettering or marking is not acceptable.

3.3 BOXES AND SUPPORTS

Boxes shall be provided in the wiring or raceway systems where required by NFPA 70 for pulling of wires, making connections, and mounting of devices or fixtures. Pull boxes shall be furnished with screw-fastened covers. Indicated elevations are approximate, except where minimum mounting heights for hazardous areas are required by NFPA 70. Unless otherwise indicated, boxes for wall switches shall be mounted 48 inches above finished floors. Switch and outlet boxes located on opposite sides of fire rated walls shall be separated by a minimum horizontal distance of 24 inches. The total combined area of all box openings in fire rated walls shall not exceed 100 square inches per 100 square feet. Maximum box areas for individual boxes in fire rated walls vary with the manufacturer and shall not exceed the maximum specified for that box in UL Elec Const Dir. Only boxes listed in UL Elec Const Dir shall be used in fire rated walls.

3.3.1 Box Applications

Each box shall have not less than the volume required by NFPA 70 for number of conductors and yokes enclosed in box. Boxes for metallic raceways shall be listed for the intended use when located in normally wet locations, when flush or surface mounted on outside of exterior surfaces, or when located in hazardous areas. Boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Boxes for mounting lighting fixtures shall be not less than 4 inches square, or octagonal, except smaller boxes may be installed as required by fixture configuration, as approved. Cast-metal boxes with 3/32 inch wall thickness are acceptable. Large size boxes shall be NEMA 4 or as shown. Boxes in other locations shall be sheet steel. Boxes for use in masonry-block or tile walls shall be square-cornered, tile-type, or standard boxes having square-cornered, tile-type covers.

3.3.2 Brackets and Fasteners

Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and metal expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screw or welded studs on steel work. Threaded studs driven in by

powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws. Penetration of more than 1-1/2 inches into reinforced-concrete beams or more than 3/4 inch into reinforced-concrete joists shall avoid cutting any main reinforcing steel. The use of brackets which depend on gypsum wallboard or plasterboard for primary support will not be permitted.

3.4 DEVICE PLATES

One-piece type device plates shall be provided for all outlets and fittings. Plates on unfinished walls and on fittings shall be of zinc-coated sheet steel, cast-metal, or impact resistant plastic having rounded or beveled edges. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified.

3.5 RECEPTACLES

3.5.1 Single and Duplex, 15 or 20-ampere, 125 volt

Single and duplex receptacles shall be rated 20 amperes, 125 volts, two-pole, three-wire, grounding type with polarized parallel slots. Bodies shall be as indicated to match color of switch handles in the same room or to harmonize with the color of the respective wall, and supported by mounting strap having plaster ears. Contact arrangement shall be such that contact is made on two sides of an inserted blade. Receptacle shall be side- or back-wired with two screws per terminal. The third grounding pole shall be connected to the metal mounting yoke. Switched receptacles shall be the same as other receptacles specified except that the ungrounded pole of each suitable receptacle shall be provided with a separate terminal. Only the top receptacle of a duplex receptacle shall be wired for switching application. Receptacles with ground fault circuit interrupters shall have the current rating as indicated, and shall be UL Class A type unless otherwise shown. Ground fault circuit protection shall be provided as required by NFPA 70 and as indicated on the drawings.

3.5.2 Weatherproof Applications

Weatherproof receptacles shall be suitable for the environment, damp or wet as applicable, and the housings shall be labeled to identify the allowable use. Receptacles shall be marked in accordance with UL 514A for the type of use indicated; "Damp locations", "Wet Locations", "Wet Location Only When Cover Closed". Assemblies shall be installed in accordance with the manufacturer's recommendations.

3.5.2.1 Damp Locations

Receptacles in damp locations shall be mounted in an outlet box with a gasketed, weatherproof, cast-metal cover plate (device plate, box cover) and a gasketed cap (hood, receptacle cover) over each receptacle opening. The cap shall be either a screw-on type permanently attached to the cover plate by a short length of bead chain or shall be a flap type attached to the cover with a spring loaded hinge.

3.5.2.2 Wet Locations

Receptacles in wet locations shall be installed in an assembly rated for such use whether the plug is inserted or withdrawn, unless otherwise

indicated. In a duplex installation, the receptacle cover shall be configured to shield the connections whether one or both receptacles are in use.

3.6 WALL SWITCHES

Not more than one switch shall be installed in a single-gang position. Switches shall be rated 20-ampere 120-volt for use on alternating current only. Pilot lights indicated shall consist of yoke-mounted candelabra-base sockets rated at 75 watts, 125 volts, and fitted with glass or plastic jewels. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be green, and jewels for other purposes shall be red. Dimming switches shall be solid-state flush mounted, sized for the loads.

3.7 SERVICE EQUIPMENT

Service-disconnecting means shall be of the fusible safety switch type with an external handle for manual operation. When service disconnecting means is a part of an assembly, the assembly shall be listed as suitable for service entrance equipment. Enclosures shall be sheet metal with hinged cover for surface mounting unless otherwise indicated.

3.8 PANELBOARDS

Circuit breakers and switches used as a motor disconnecting means shall be capable of being locked in the open position. Door locks shall be keyed alike. Nameplates shall be as approved. Directories shall be typed to indicate loads served by each circuit and mounted in a holder behind a clear protective covering. Busses shall be copper. Panelboards shall be circuit breaker or fusible switch equipped as indicated on the drawings.

3.9 FUSES

Equipment provided under this contract shall be provided with a complete set of properly rated fuses when the equipment manufacturer utilize fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination.

3.9.1 Cartridge Fuses; Noncurrent-Limiting Type

Cartridge fuses of the noncurrent-limiting type shall be Class H, nonrenewable, dual element, time lag type and shall have interrupting capacity of 10,000 amperes. At 500 percent current, cartridge fuses shall not blow in less than 10 seconds.

3.10 UNDERGROUND SERVICE

Unless otherwise indicated, interior conduit systems shall be stubbed out 5 feet beyond the building wall and 2 feet below finished grade, for interface with the exterior service lateral conduits. Outside conduit ends shall be bushed when used for direct burial service lateral conductors. Outside

conduit ends shall be capped or plugged until connected to exterior conduit systems. Underground service lateral conductors will be extended to building service entrance and terminated in accordance with NFPA 70.

3.11 LIGHTING FIXTURES, LAMPS AND BALLASTS

This paragraph shall cover the installation of lamps, lighting fixtures and ballasts in interior or structure mounted applications.

3.11.1 Lamps

Lamps of the type, wattage, and voltage rating indicated shall be delivered to the project in the original cartons and installed just prior to project completion. Lamps installed and used for working light during construction shall be replaced prior to turnover to the Government if more than 15% of their rated life has been used. Lamps shall be tested for proper operation prior to turn-over and shall be replaced if necessary with new lamps from the original manufacturer. Ten percent spare lamps of each type, from the original manufacturer, shall be provided.

3.11.2 Lighting Fixtures

3.11.2.1 Accessories

Accessories such as straps, mounting plates, nipples, or brackets shall be provided for proper installation.

3.12 LIGHT POLE INSTALLATION

Pole lengths shall provide a luminaire mounting height as shown on drawings. Luminaire mounting height may be increased by the height of the transformer base where required. Electrical cabling shall be provided to the light pole as shown. Pole installation shall conform to the manufacturer's recommendations, NFPA 70, and IEEE C2. Poles shall be set straight and plumb.

3.12.1 Pole Brackets

Brackets shall be installed as specified by the manufacturer and as shown on drawings. Mounting hardware shall be sized appropriately to secure the mount, luminaire, and housing with wind loading normally encountered at the site.

3.13 EQUIPMENT CONNECTIONS

Wiring not furnished and installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements of paragraph WIRING METHODS. Flexible conduits 6 feet or less in length shall be provided to all electrical equipment subject to periodic removal, vibration, or movement and for all motors. All motors shall be provided with separate grounding conductors. Liquid-tight conduits shall be used in damp or wet locations.

3.14 CIRCUIT PROTECTIVE DEVICES

The Contractor shall calibrate, adjust, set and test each new adjustable circuit protective device to ensure that they will function properly prior to the initial energization of the new power system under actual operating conditions.

3.15 PAINTING AND FINISHING

Field-applied paint on exposed surfaces shall be provided under Section 09900b PAINTING, GENERAL.

3.16 REPAIR OF EXISTING WORK

The work shall be carefully laid out in advance, and where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceiling, or other surfaces is necessary for the proper installation, support, or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to building, piping, or equipment shall be repaired by skilled mechanics of the trades involved at no additional cost to the Government.

3.17 FIELD TESTING

Field testing shall be performed in the presence of the Contracting Officer. The Contractor shall notify the Contracting Officer 2 days prior to conducting tests. The Contractor shall furnish all materials, labor, and equipment necessary to conduct field tests. The Contractor shall perform all tests and inspection recommended by the manufacturer unless specifically waived by the Contracting Officer. The Contractor shall maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. All field test reports will be signed and dated by the Contractor.

3.17.1 Safety

The Contractor shall provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. The Contractor shall replace any devices or equipment which are damaged due to improper test procedures or handling.

3.17.2 Ground-Resistance Tests

The resistance of each grounding electrode, each grounding electrode system, and the grounding grid shall be measured using the fall-of-potential method defined in IEEE Standard 81, Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Ground System. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

- a. Single rod electrode - 25 ohms.

3.17.3 Ground-Grid Connection Inspection

All below-grade ground-grid connections will be visually inspected by the Contracting Officer before backfilling. The Contractor shall notify the Contracting Officer 48 hours before the site is ready for inspection.

3.17.4 Cable Tests

The Contractor shall be responsible for identifying all equipment and devices that could be damaged by application of the test voltage and ensuring that they have been properly disconnected prior to performing insulation resistance testing. An insulation resistance test shall be performed on all low and medium voltage cables after the cables are installed in their final configuration and prior to energization. The test voltage shall be 500 volts DC applied for one minute between each conductor and ground and between all possible combinations of conductors. The minimum value of resistance shall be:

$R \text{ in megohms} = (\text{rated voltage in kV} + 1) \times 1000 / (\text{length of cable in feet})$

Each cable failing this test shall be repaired or replaced. The repaired cable system shall then be retested until failures have been eliminated.

3.17.4.1 Low Voltage Cable Tests

- a. Continuity test.
- b. Insulation resistance test.

3.17.5 Motor Tests

- a. Insulation resistance of each winding to ground.
- b. Vibration test.

3.17.6 Circuit Breaker Tests

The following field tests shall be performed on circuit breakers.

3.17.6.1 Circuit Breakers, Molded Case

- a. Insulation resistance test phase-to-phase, all combinations.
- b. Insulation resistance test phase-to-ground, each phase.
- c. Closed breaker contact resistance test.
- d. Manual operation of the breaker.

3.18 OPERATING TESTS

After the installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the specified requirements. An operating test report shall be submitted in accordance with paragraph FIELD TEST REPORTS.

3.19 FIELD SERVICE

3.19.1 Installation Engineer

After delivery of the equipment, the Contractor shall furnish one or more field engineers, regularly employed by the equipment manufacturer to supervise the installation of equipment, assist in the performance of the onsite tests, oversee initial operations, and instruct personnel as to the operational and maintenance features of the equipment.

3.20 ELECTRIC SERVICE

Contractor shall coordinate the installation of the adjacent metering pole and riser.

3.21 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.